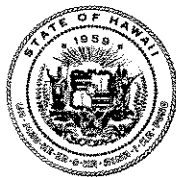


LINDA LINGLE
GOVERNOR
STATE OF HAWAII



MICAH A. KANE
CHAIRMAN
HAWAIIAN HOMES COMMISSION

BEN HENDERSON
DEPUTY TO THE CHAIRMAN

KAULANA H. PARK
EXECUTIVE ASSISTANT

STATE OF HAWAII
DEPARTMENT OF HAWAIIAN HOME LANDS

P.O. BOX 1879

HONOLULU, HAWAII 96805

August 23, 2005

RECEIVED
05 AUG 23 P1:38
OFFICE OF ENVIRONMENTAL
QUALITY CONTROL

Ms. Genevieve Salmonson, Director
Office of Environmental Quality Control
235 South Beretania Street, Room 702
Honolulu, Hawaii 96813

Dear Ms. Salmonson:

Subject: Finding Of No Significant Impact (FONSI) for
Waiohuli Homestead Community, TMK 2-2-002: 014
(portion) and 055 (portion), Waiohuli, Maui, Hawaii

The State of Hawaii Department of Hawaiian Home Lands has reviewed the comments received during the 30-day public comment period which began on June 8, 2005. The agency has determined that this project will not have significant environmental effects and has issued a FONSI. Please publish this notice in the September 8, 2005 OEQC Environmental Notice.

We have enclosed the following items:

1. Two hard copies and one PDF (on CD) of the Final EA, and
2. Completed publication form (also to be emailed).

Should you have any questions regarding the project in general, please call Mr. Darrell Ing of our Land Development Division at 587-6451.

Aloha and mahalo,

A handwritten signature in black ink, appearing to read "MICK", is written over the typed name of Micah A. Kane.

Micah A. Kane, Chairman
Hawaiian Homes Commission

enc.



Waiohuli Homestead Community

FINAL ENVIRONMENTAL ASSESSMENT /
FINDING OF NO SIGNIFICANT IMPACT

Prepared for:

Department
of
Hawaiian Home Lands

Prepared by:



August 2005

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WAIHOULI HOMESTEAD COMMUNITY
FINAL ENVIRONMENTAL ASSESSMENT/FINDING OF NO SIGNIFICANT IMPACT

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1.0 INTRODUCTION

1.1 PROJECT SUMMARY

The following summary describes the project location, existing entitlements, and proposed actions:

Project Name:	Waiohuli Homestead Community
Location:	Waiohuli, Upcountry, Maui, Hawai'i (Figure 1)
Landowner:	State of Hawai'i, Department of Hawaiian Home Lands
Applicant:	State of Hawai'i, Department of Hawaiian Home Lands
Tax Map Key:	2-2-002: 014 (portion) and 055 (portion) (Figure 2)
Land Area:	Approximately 523 acres
Existing Use:	Cattle grazing under a short-term lease
Proposed Use:	Single-family residential and archaeological preserves (Figure 3)
Land Use Designations:	State Land Use District – Agricultural (Figure 4) Maui County General Plan – Agricultural Maui County Zoning – Agricultural Makawao-Pukalani-Kula Community Plan–Agricultural (Figure 5)
Action Requested:	Use of State lands and funds for the development of a single-family residential community for DHHL beneficiaries
Accepting Authority:	Department of Hawaiian Home Lands, State of Hawai'i
Determination:	Finding of No Significant Impact (FONSI)

1.2 PROPOSING AGENCY

In accordance with Section 343-5(b), *Hawaii Revised Statutes* (HRS), whenever an agency proposes the use of State lands, that agency shall prepare an environmental assessment for such action at the earliest practicable time to determine whether an environmental impact statement shall be required.

To identify the appropriate uses for the study area, the Department of Hawaiian Home

Lands (DHHL) has contracted PBR HAWAII to prepare an environmental assessment in compliance with Chapter 343, HRS. The DHHL is the proposing agency for this project. The mailing address and primary contact person for the DHHL is listed below:

Mr. Darrell Ing
State of Hawai'i
Department of Hawaiian Home Lands
Land Development Division
P.O. Box 1879
Honolulu, Hawaii 96805

1.3 OWNERSHIP AND MAJOR APPROVALS REQUIRED

The DHHL is the landowner of the subject property and the agency preparing this environmental assessment. The DHHL is also acting as applicant for the applicable entitlements. Primary approval from the State will be acceptance of the environmental disclosure documents in accordance with Chapter 343, HRS.

1.4 DESCRIPTION OF THE PROPERTY

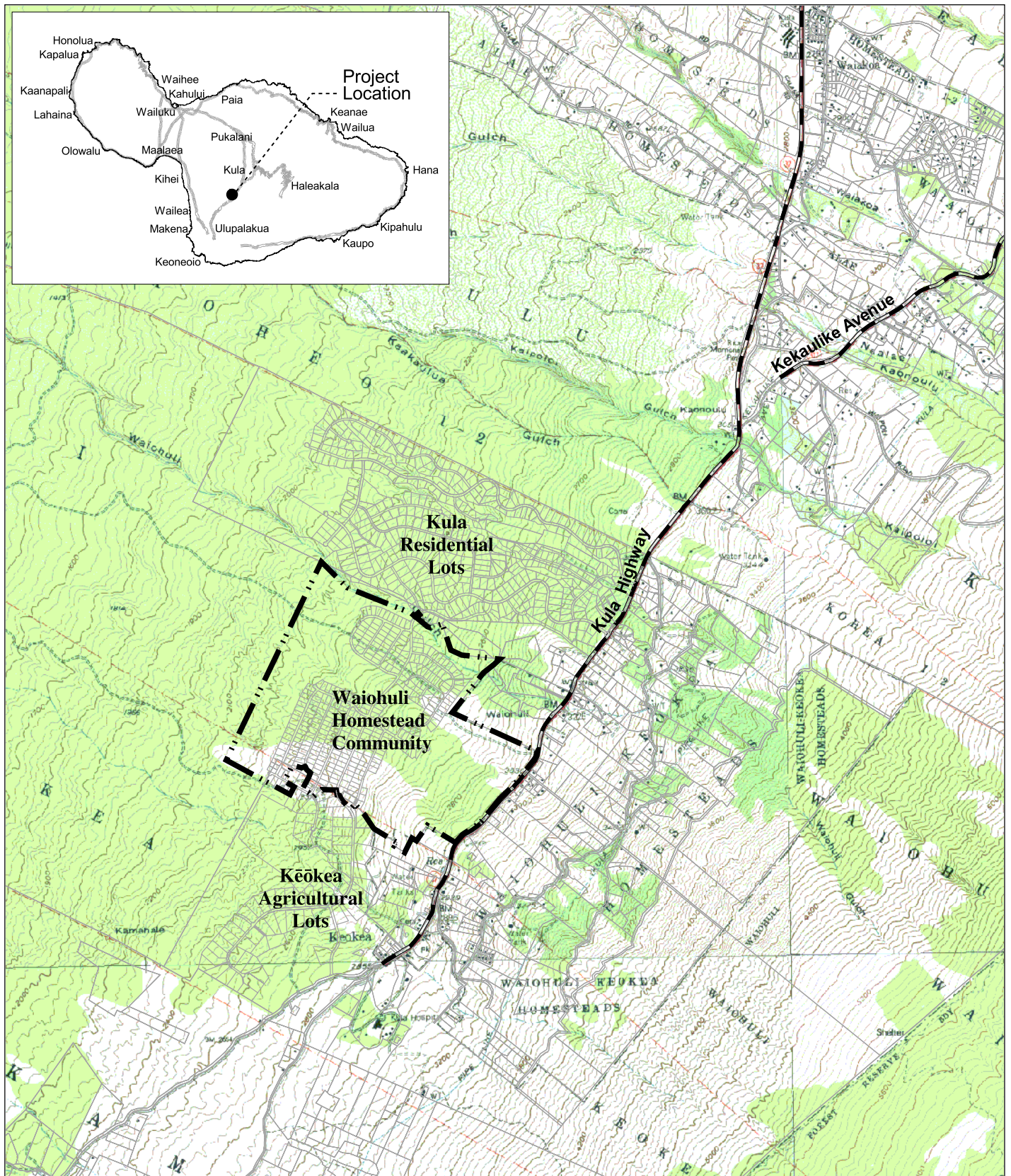
The subject property is located in Kēōkea, in the Kula district on the island of Maui. This region is commonly referred to as “Upcountry” Maui.

The property is part of the DHHL Kēōkea/Waiohuli tract, which includes 6,112 acres west of and adjacent to Kula Highway. This tract is the DHHL's second largest land holding in Maui and is bounded to the north by Ka'ono'ulu Ranch, to the east by Kula Highway, and to the south and west by Haleakalā Ranch. The subject property is surrounded on three sides by lands part of the Kēōkea/Waiohuli tract and is bounded to the east by Kula Highway (Figure 1). The property is approximately nine miles south of Pukalani and approximately five miles east of Kihei. The property includes approximately 523 acres of land used for cattle grazing under a short-term lease.

1.5 SURROUNDING LAND USES

The Kula region is located on the western slopes of Haleakalā, with the population focused on two principal settlement areas. The towns of Makawao and Pukalani reflect a mixture of suburban and rural land uses, while the Kula area is characterized by a combination of rural and agricultural uses. Land uses in the vicinity of the subject property include low-density rural residential properties, small farms, and lands utilized for agricultural cultivation and ranching activities.

Kula Residential Lots – Unit 1 (also referred to as Waiohuli Subdivision) is located directly north of the Waiohuli Homestead Community site (in the northeastern corner of the DHHL Kēōkea/Waiohuli tract). Kula Residential Lots – Unit 1 contains 321 completed



Legend

— Waiohuli Homestead Community

Source:
Community Planning and Engineering, Inc.
Austin Tsutsumi & Associates, Inc.
U.S. Geological Survey

Disclaimer: This map has been prepared for
general planning purposes only.

Figure 1

Location Map

Waiohuli Homestead Community

DEPARTMENT OF HAWAIIAN HOME LANDS

KULA, MAUI

NORTH

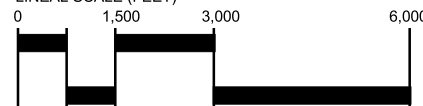
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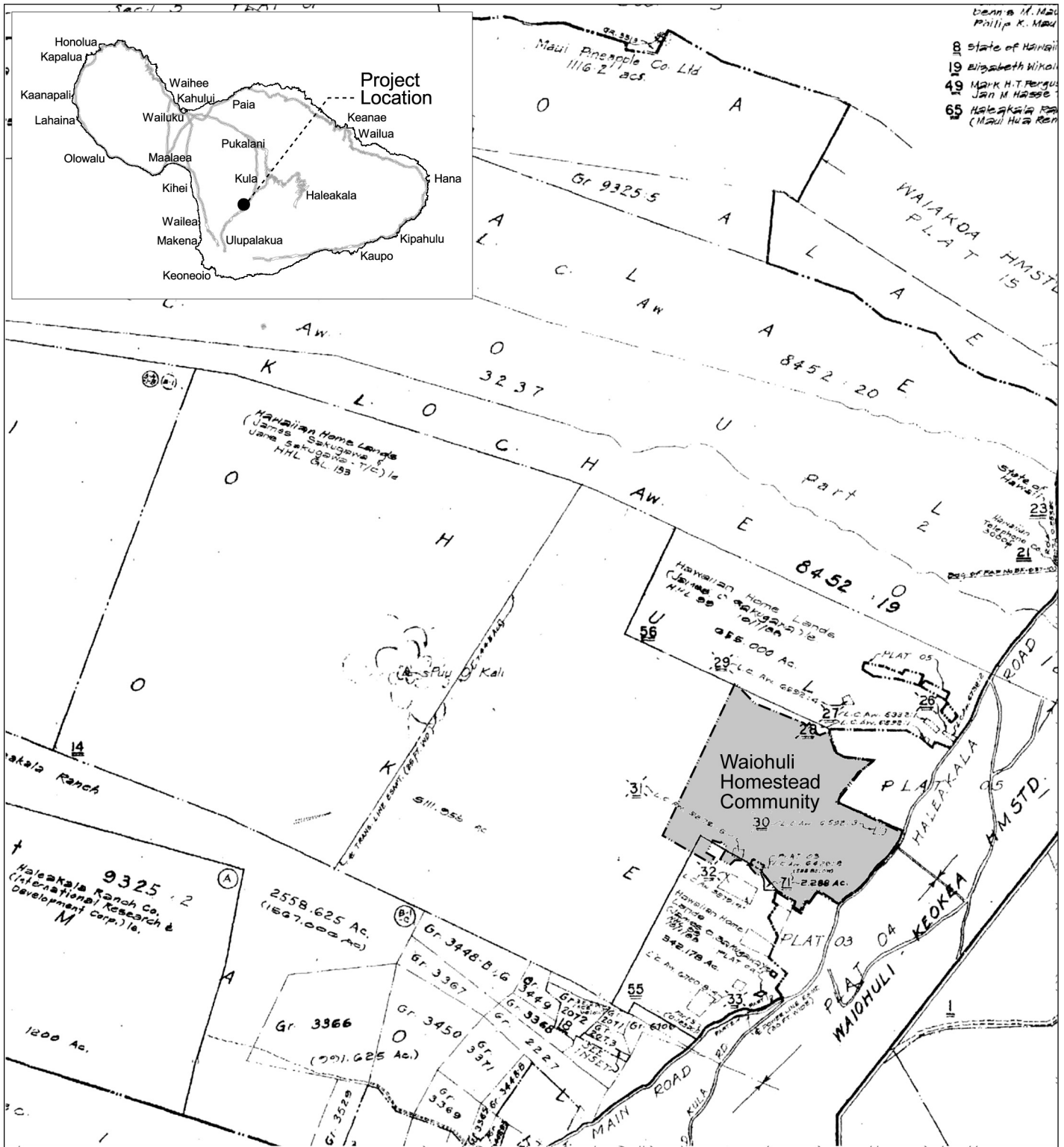
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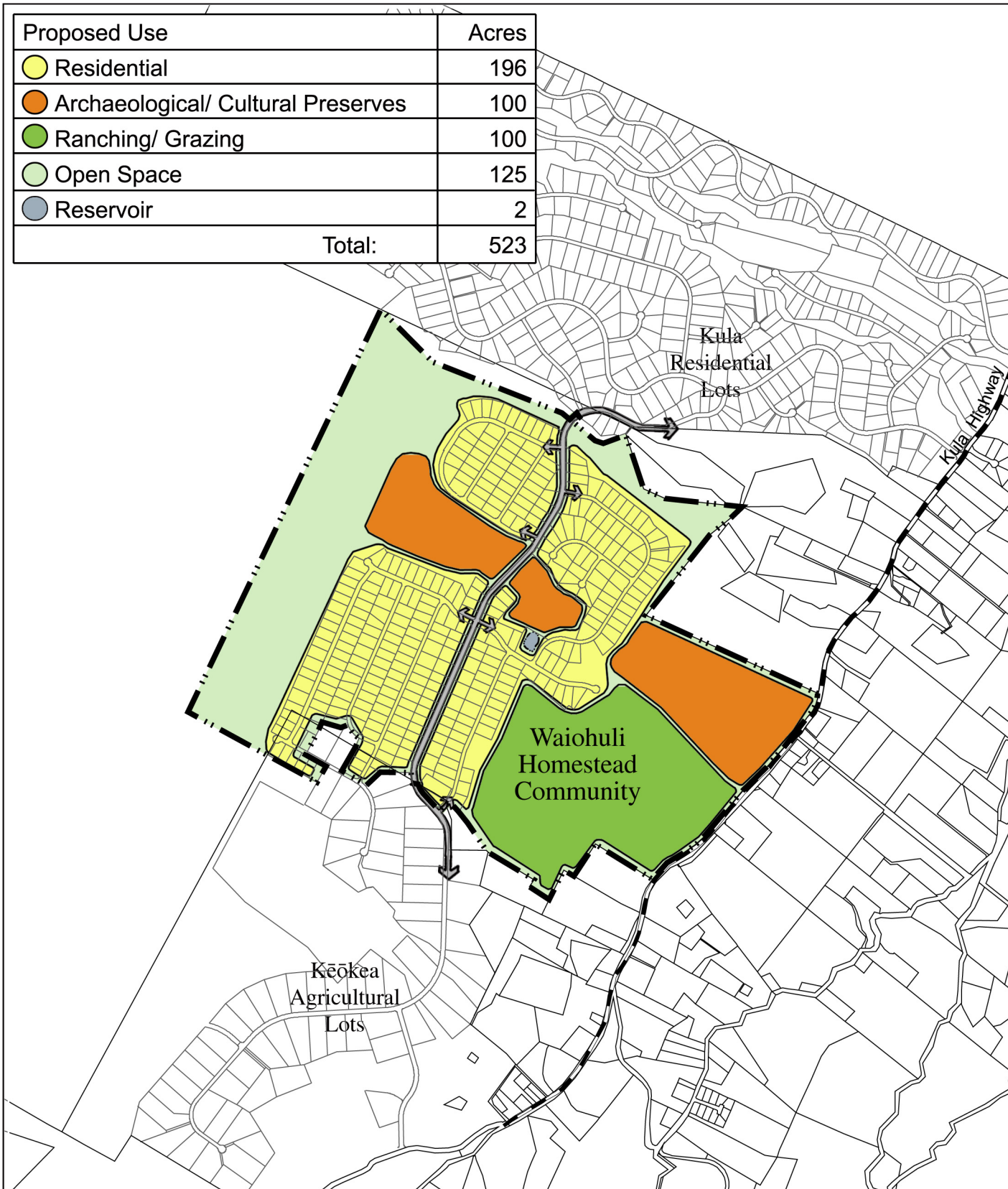
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Source: Tax Maps Bureau

Disclaimer: This map has been prepared for general planning purposes only.



Legend

— Waiohuli Homestead Community

Figure 3
Conceptual Plan
Waiohuli Homestead Community

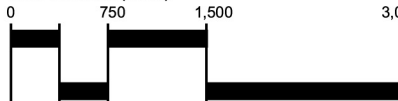
DEPARTMENT OF HAWAIIAN HOME LANDS

KULA, MAUI

NORTH

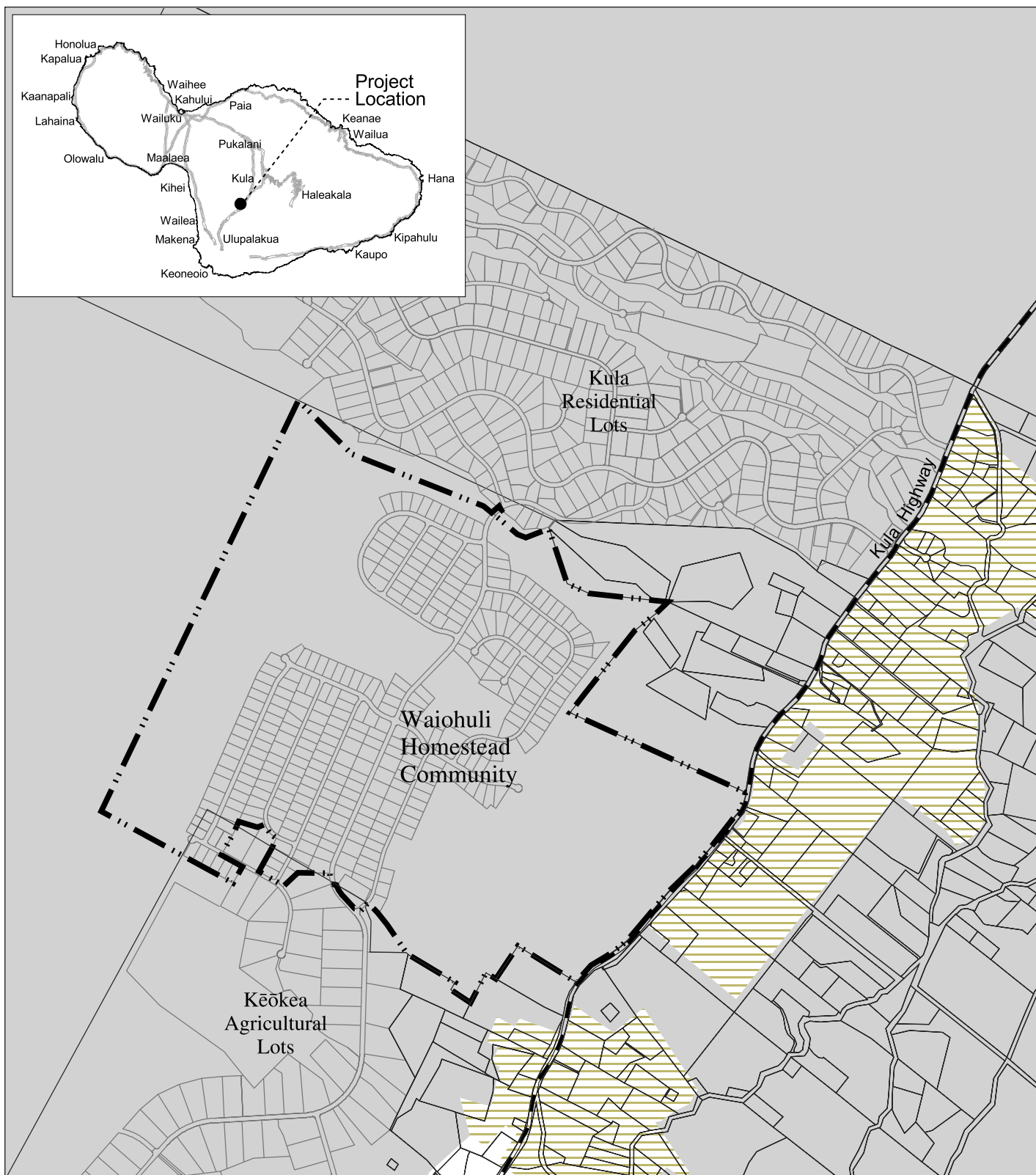
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


Source: Community Planning and Engineering, Inc.
Austin Tsutsumi and Associates, Inc.

Disclaimer: This map has been prepared for
general planning purposes only.



Legend

-  Waiohuli Homestead Community
-  Agricultural District
-  Rural District

Source:
State Land Use Commission
Community Planning and Engineering, Inc.
Austin Tsutsumi and Associates, Inc.

Disclaimer: This map has been prepared for
general planning purposes only.

Figure 4

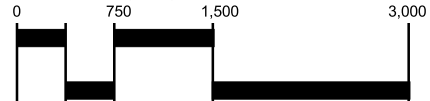
State Land Use District Boundary Map Waiohuli Homestead Community

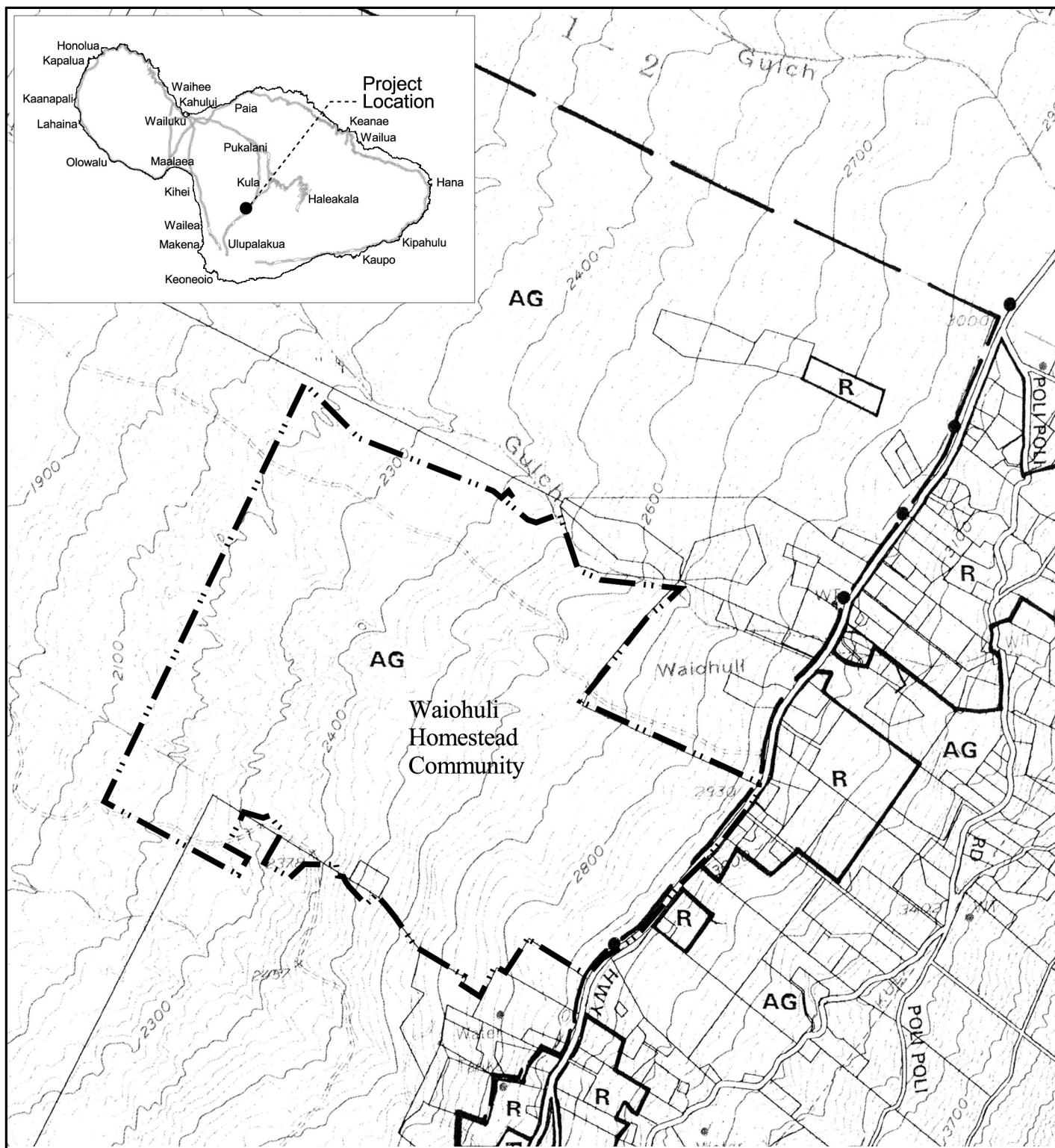
DEPARTMENT OF HAWAIIAN HOME LANDS

KULA, MAUI

NORTH

LINEAL SCALE (FEET)





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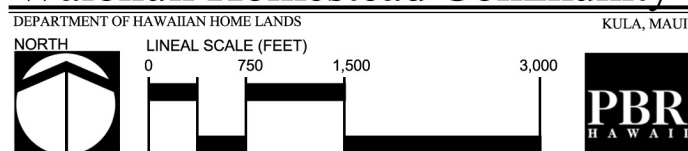
-  Waiohuli Homestead Community
-  Agriculture
-  Rural

Figure 5
Makawao - Pukalani - Kula Community Plan
Waiohuli Homestead Community



Source: County of Maui

Disclaimer: This map has been prepared for general planning purposes only.

lots that were built in 2000 and are either ready for occupancy or are already occupied. An additional 99 in-fill lots (referred to as Kula Residential Lots – Unit 2) are planned to be developed.

The DHHL also plans to develop 69 agricultural lots (referred to as Kēōkea Agricultural Lots – Unit 1) directly south of the Waiohuli Homestead Community site (in the southeastern corner of DHHL Kēōkea/Waiohuli tract).

Haleakalā Ranch has developed a master plan for a high-income community adjacent to the Kēōkea/Waiohuli tract. Preliminary plans show a town center, parks, and residential communities.

1.6 BACKGROUND

The mission of the DHHL is to manage the Hawaiian Home Lands trust effectively and develop and deliver land to native Hawaiians¹. The DHHL proposes to develop the Waiohuli Homestead Community on an approximately 523-acre property in the Kula district of Maui. The proposed action will be implemented under the provisions of the Hawaiian Homes Commission Act (HHCA), 1920, as amended. The HHCA authorizes the DHHL to lease to native Hawaiians the right to use and occupy Hawaiian home lands for agricultural, pastoral, and residential purposes, and to grant licenses to public utilities and others for various purposes. In accordance with the HHCA, Hawaiian home lands are not subject to zoning or other land use controls by the State or County. The following is a list of permits/approvals for which this project is exempt:

- **State Land Use Commission District Boundary**
 - Chapter 205, Hawaii Revised Statutes, as Amended
 - State Land Use Commission Rules
- **Title 19, Zoning: Maui County Code, 1980, as Amended**
 - Chapter 19.02, Regulations Generally
 - Chapter 19.06, Districts and Boundaries
 - Chapter 19.510, Application and Procedures
- **Community Plan**
 - Maui County Code, Chapter 2.80
 - Maui County Charter, Sections 8-8.4 and 8-8.5
- **Parks Dedication**
 - Maui County Code, Section 18.16.320B
- **Street Tree Planting**
 - Maui County Code, Section 12.24A.070
- **Subdivision Filing Fee**
 - Maui County Code, Chapter 18.24

¹ In this report, a lower case “n” is used in the phrase “native Hawaiian” when referring to Hawaiian Homes Commission Act beneficiaries, who by definition must have 50 percent Hawaiian ancestry in order to qualify. The upper case “N” is used when more generally describing persons with any percentage of Hawaiian ancestry, as for Federal programs regarding health and education.

- **Subdivision Design Standards**
 - Maui County Code 18.20.070, Sidewalks
 - Maui County Code 18.20.080, Curbs and Gutters
 - Maui County Code 18.20.140B, Underground Utilities
 - Maui County Code 19.04.040, Minimum Distance Between Flag Lots
 - Maui County Code 19.08.040, Minimum Lot Width and Area
 - Maui County Code 18.16.130, Minimum Cul-De-Sac Length and Lots Serviced
 - Maui County Code 18.16.220, Minimum Lot Width for All Corner Lots
- **Title 18, Subdivisions: Maui County Code**
 - Article 18.20.200
 - Article 18.20.210
 - Article 18.20.220
 - Article 18.20.230
 - Article 18.20.260
 - Article 18.20.270
- **Final Plat**
 - Maui County Code 18.12.040, Tax Clearance Certification
 - Maui County Code 18.12.060, Filing for Extensions of Preliminary Plan Action for Final Subdivision Approval
- **Dedication of Roadways and Improvements Solely for Maintenance Purposes, Section 18.40.040 of the Subdivision Code for Acceptance Guidelines**

The exemptions listed above are intended to facilitate the granting of final subdivision approval to allow for the construction of houses prior to the full construction and completion of the subdivision and to minimize the cost of improvements. As stated in the DHHL's Declaration of Exemptions letter to the County of Maui Department of Public Works and Environmental Management Development Services Administration (dated March 31, 2005 and included in Appendix A), "[t]hese exemptions will not substantially endanger human health or safety and are in the public's interest. Compliance with those sections of the Maui County Code that this project is being exempted from would produce serious hardship without equal or greater benefit to the lessees or the public."

The DHHL Waiohuli Homestead Community involves the development of 196 acres (providing approximately 337 residential lots) for single-family residential use. Infrastructure improvements required for the proposed project include the construction of access and circulation roadways, water storage and transmission facilities, drainage systems, individual septic tanks, and electrical/communication systems to service the proposed development.

2.0 DESCRIPTION OF THE PROJECT

2.1 PROJECT GOALS AND OBJECTIVES

The objective of this project is to provide a livable community for native Hawaiians, which would include the development of 337 single-family residential lots.

2.2 NEED FOR THE PROJECT

According to the *DHHL Applicant Survey, 2003* (SMS 2004), there has been a 57 percent increase in applicants for homesteads since 1995. Based on indicated preferences and focus groups, most applicants are looking to the DHHL to provide them with housing solutions. Of the three types of land awards (pastoral, agricultural, and residential), newer applicants have mostly applied for residential only or agricultural and residential land. Residential only applications have increased by 98 percent since 1995. Approximately 26.8 percent of qualified Maui applicants indicated that they preferred turnkey homes.

As of February 28, 2005, there were 6,969 applications for Hawaiian home lands on Maui (3,202 residential applications; 3,365 agricultural applications; and 402 pastoral applications). Based on location preference indicated in the 2003 applicant survey, the highest demand for land in Maui was for the Pa'ia, Ha'ikū, Upcountry Maui area.

In 2003, approximately 58 percent of Maui applicants were below the 80 percent median income guidelines established by the U.S. Department of Housing and Urban Development (HUD), making home ownership difficult to impossible. The Waiohuli Homestead Community will help to meet the growing demand for residential land by providing much needed single-family homes for native Hawaiians. The project will also help to ease the statewide shortage of housing, as residences will become available to the general population once DHHL beneficiaries move to their homestead lots.

2.3 KEY ELEMENTS OF THE CONCEPTUAL PLAN

The project site is approximately 523 acres, and the proposed Waiohuli Homestead Community will be developed on approximately 196 acres. Approximately 337 single-family residential units (20,000-square-foot minimum lots) and 40- to 50-foot-wide paved roadways will be developed (Figure 3). (The number of lots that can be developed is dependent on the water supply available to the DHHL.) The 523-acre site will also include 100 acres for archaeological/cultural preserves, 100 acres for ranching/grazing, and 125 acres for open space. In support of the development, infrastructure facilities to be expanded or improved include access and circulation roadways, drainage systems, water distribution lines, individual septic tanks, and electrical/communication systems. The DHHL is exempt from Maui County Code Subdivision Design Standards and the Subdivision Code. However, the DHHL shall complete all improvements and install utilities in accordance with the construction plans approved by the County of Maui.

2.3.1 Site Development

The final layout and configuration of the proposed Waiohuli Homestead Community will be refined through the planning, engineering, and design process to ensure that long-range use of the property will be consistent with surrounding land uses. Where appropriate, guidelines for sustainable building design will be considered. Major land use elements of the conceptual plan (Figure 3) are described below.

Single-Family Residential

The number of residential lots within the Waiohuli Homestead Community site is directly related to the water supply available under the Water Credits Agreement between the DHHL and the County of Maui Department of Water Supply (DWS). Water is supplied to the DHHL Kēōkea/Waiohuli tract, which includes the Kula Residential Lots – Unit 1 and Unit 2, and the Kēōkea Agricultural Lots – Unit 1. The Water Credits Agreement is further discussed in Sections 2.4.1 and 6.2 of this EA. According to initial calculations, there is enough water to serve the 337 residential lots proposed in the Waiohuli Homestead Community. Individual awardees will be responsible for construction of the Waiohuli Homestead Community homes. Ohana units or second dwellings on each lot will not be allowed.

Archaeological/Cultural Preserves

Approximately 100 acres of the 523-acre site will remain in its existing condition to preserve archaeological and cultural sites.

Ranching/Grazing

Approximately 100 acres will be used for ranching and grazing.

Open Space

Approximately 125 acres will be designated for open space.

2.4 INFRASTRUCTURE IMPROVEMENTS

Construction of the proposed Waiohuli Homestead Community will begin with the development of necessary infrastructure facilities, after the applicable grading permits are issued.

On-site Improvements. Presently, there are no significant infrastructure facilities located on the property. Roadways through the Kēōkea Agricultural Lots and the Kula Residential Lots provide the closest major transportation access. New on-site infrastructure will be required, including water storage, transmission, and distribution facilities; individual septic tanks; internal roadways; drainage facilities; and electrical and communication systems.

Off-site Improvements. An additional parallel 12-inch diameter water line within the Kula Residential Lots – Unit 1 will be installed to accommodate the water demand for the Waiohuli Homestead Community. All telecommunications infrastructure (i.e.,

underground conduit, handholes, and cabling) will be installed by Sandwich Isles Communications, Inc. (SIC) at no cost to the DHHL. SIC will install its fiber optic network from its existing networks through Kēōkea Agricultural Lots and Kula Residential Lots. All improvements will be designed in accordance with the applicable standards of the County, State, and public utilities companies.

2.4.1 Water Supply and Distribution

The DHHL has a Water Credits Agreement (signed on December 9, 1997) with the DWS. This agreement states that the DWS shall commit 500,000 gallons of potable water per day (gpd) to DHHL home sites. The agreement also states that the DWS shall maintain the improvements and deliver potable water, except during drought periods affecting lower Kula, as declared by the DWS in accordance with its rules and regulations. According to the agreement, the DWS shall not impose any time limitations on the DHHL to draw or use such reservation of potable water from the DWS system.

The number of lots that can be developed for the Waiohuli Homestead Community is limited by the amount of water available under the Water Credits Agreement. The existing 321-unit Kula Residential – Unit 1, the planned 99-unit Kula Residential – Unit 2 in-fill development, and the proposed 69-unit Kēōkea Agricultural Lots will use approximately 293,400 gpd from the 500,000-gpd Water Credits Agreement. Approximately 206,600 gpd would be available; however, 4,250 gpd of the available supply has been allocated to a proposed 2.5-acre park within the Kula Residential Lots. Therefore, only 202,350 gpd would be available for the development covered by this EA. According to the DOH, the anticipated consumption for the project would be approximately 202,200 gpd; therefore, there is sufficient capacity under the Water Credits Agreement to service an additional 337 units.

2.4.2 Wastewater Collection and Transmission

The Makawao-Pukalani-Kula region is not currently serviced by a County wastewater treatment system. For developments of 50 or more residential lots, the State Department of Health (DOH) requires a wastewater treatment facility to service the subdivision. However, individual waste disposal systems for the proposed Waiohuli Homestead Community are allowed by the DOH under the variance application granted (Docket No. 04-VWW-02).

2.4.3 Drainage Facilities

The Upcountry region can be characterized as having broad, rolling ridge tops, deep precipitous gulches, and slopes increase along ridges as the terrain ascends in elevation. There are many gulches that separate the region's arable lands into smaller areas.

The Waiohuli Homestead Community site currently does not have any significant drainage facilities. The site consists of approximately 523 acres of land used for cattle grazing; however, the natural slope and well-draining soils on the site provide adequate

drainage for current conditions. When rainfall is heavy enough to produce overland flow, water sheet flows and enters Waiohuli Gulch, which flows through the northern portion of the site. The entire 523-acre site and surrounding area is designated Zone C (areas of minimal flooding) by the Flood Insurance Rate Map (Figure 6).

2.4.4 Transportation Improvements

The Kula Residential Lots has two existing access points onto the Kula Highway. There is also an internal network of roadways serving this subdivision. The roadways are paved right-of-ways without curbs, gutters, or sidewalks, in conformance with County rural standards.

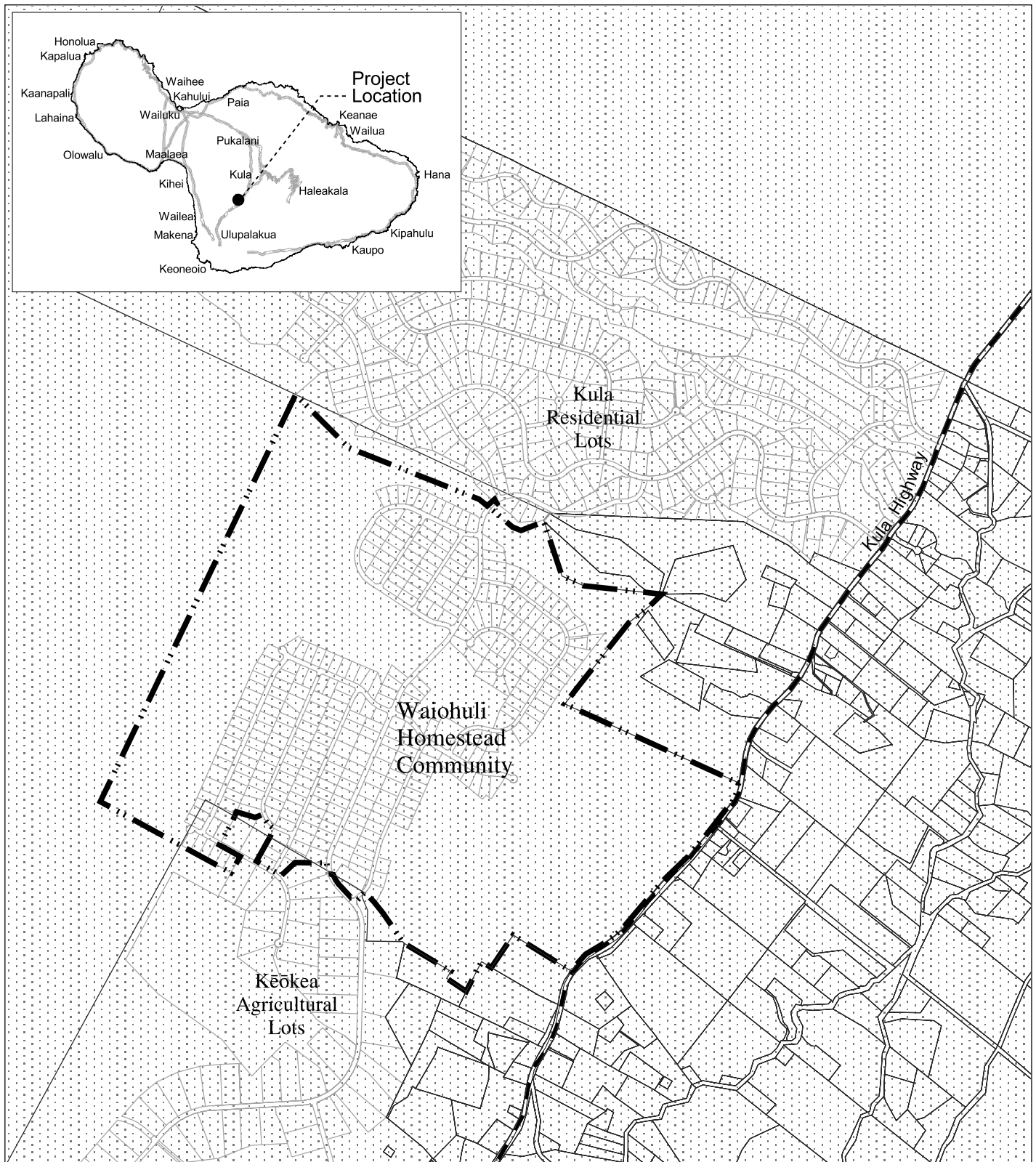
Road improvements within the existing Kula Residential Lots and the planned Kēōkea Farm Lots will serve as the primary access to the proposed Waiohuli Homestead Community. A mid-level road at the 2,500-foot elevation will connect Waiohuli and Kēōkea and provide access points from Kula Highway to the proposed 337-lot development. The HHCA mandates that the County maintain the roadways on Hawaiian home lands.

2.5 PHASING AND TIMING OF ACTION



Planning and engineering for the Waiohuli Homestead Community is in process and will run through summer 2005. Infrastructure will be constructed in four phases (approximately 80 lots each), one phase commencing each fall in 2005, 2006, 2007, and 2008. House construction and occupancy would follow each phase of infrastructure development.

2.6 COST ESTIMATE

The total estimated cost of improvements is approximately \$55 million.



Legend

-  Waiohuli Homestead Community
-  Zone C:
Areas of Minimal Flooding

Source:
Federal Emergency Management Agency
Community Planning and Engineering, Inc.
Austin Tsutsumi and Associates, Inc.

Disclaimer: This map has been prepared for
general planning purposes only.

Figure 6

Flood Insurance Rate Map Waiohuli Homestead Community

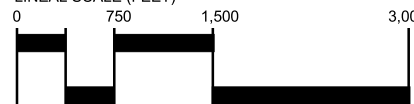
DEPARTMENT OF HAWAIIAN HOME LANDS

KULA, MAUI

NORTH

LINEAL SCALE (FEET)

0 750 1,500 3,000



3.0 RELATIONSHIP TO PLANS AND POLICIES

3.1 CHAPTER 343, HAWAII REVISED STATUTES

This Environmental Assessment is prepared pursuant to Chapter 343, HRS and Section 11-200-4, HAR, which states that, “the governor, or an authorized representative, whenever an action proposes the use of state lands or the use of state funds, or, whenever a state agency proposes an action within section 11-200-6(b) shall be the final authority to accept an environmental impact statement.”

Since the proposed project requires the use of State lands and funds, it will comply with applicable provisions of Chapter 343, HRS. Therefore, the Governor or designated representative, DHHL, will act as the Accepting Authority for the *Waiohuli Homestead Community Environmental Assessment*.

The Draft Environmental Assessment (DEA) was published in the Office of Environmental Quality Control’s (OEQC) *The Environmental Notice* on June 8, 2005, commencing a 30-day review period that ended on July 7, 2005. All comments on the DEA and applicable responses are included in Chapter 10.0 of this Final Environmental Assessment (FEA).

3.1.1 Chapter 205, Hawaii Revised Statutes – State Land Use Law

The State Land Use Law establishes the Land Use Commission (LUC) and gives this body the authority to designate all lands in the State into one of four districts: Urban, Rural, Agricultural, or Conservation. The Waiohuli Homestead Community site is within the Agricultural District (Figure 4). In accordance with the HHCA, Hawaiian home lands are not subject to land use controls by the State or County.

3.1.2 Chapter 226, Hawaii Revised Statutes – Hawaii State Plan

The *Hawaii State Plan* serves as a guide for the future long-range development of the State; identifies goals, objectives, policies, and priorities for the State; provides a basis for determining priorities and allocating limited resources, such as public funds, services, human resources, land, energy, water, and other resources; improves coordination of Federal, State, and County plans, policies, programs, projects, and regulatory activities; and establishes a system for plan formulation and program coordination to integrate all major State and County activities. Sections of the *Hawaii State Plan* applicable to the Waiohuli Homestead Community project are discussed in the following pages.

Section 226-4 State goals:

In order to guarantee, for present and future generations, those elements of choice and mobility that insure that individuals and groups may approach their desired levels of self-reliance and self-determination, it shall be the goal of the State to achieve:

- (1) A strong, viable economy, characterized by stability, diversity, and growth, that enables the fulfillment of the needs and expectations of Hawaii's present and future generations.*

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- (2) *A desired physical environment, characterized by beauty, cleanliness, quiet, stable natural systems, and uniqueness, that enhances the mental and physical well-being of the people.*
- (3) *Physical, social, and economic well-being, for individuals and families in Hawaii, that nourishes a sense of community responsibility, of caring, and of participation in community life.*

Discussion: The proposed Waiohuli Homestead Community will help present and future generations of native Hawaiians reach their desired level of self-reliance by providing home ownership opportunities. The project will also benefit the State by easing the shortage of housing, as beneficiaries vacate residences in the open market and move onto homestead lots. The economy will also be supported through this project, which will provide numerous construction-related employment opportunities.

Section 226-5 Objective and policies for population:

- (a) *It shall be the objective in planning for the State's population to guide population growth to be consistent with the achievement of physical, economic, and social objectives contained in this chapter.*
- (b) *To achieve the population objective, it shall be the policy of this State to:*
 - (1) *Manage population growth statewide in a manner that provides increased opportunities for Hawaii's people to pursue their physical, social, and economic aspirations while recognizing the unique needs of each county.*
 - (3) *Promote increased opportunities for Hawaii's people to pursue their socio-economic aspirations throughout the islands.*
 - (7) *Plan the development and availability of land and water resources in a coordinated manner so as to provide for the desired levels of growth in each geographic area.*

Discussion: The DHHL Waiohuli Homestead Community project is consistent with these objectives and policies by helping to satisfy the housing demand of a growing population and providing native Hawaiians with affordable housing. Socio-economic opportunities for Hawai'i's people will be offered through the project, which will provide new home ownership opportunities. Under the Water Credits Agreement between the DHHL and the County of Maui Department of Water Supply (DWS), the DWS shall commit 500,000 gallons of potable water per day (gpd) to DHHL home sites. Therefore, the number of lots that can be developed for the Waiohuli Homestead Community is limited by the amount of water available under the Water Credits Agreement.

Section 226-9 Objective and policies for the economy – federal expenditures:

- (a) *Planning for the State's economy with regard to federal expenditures shall be directed towards achievement of the objective of a stable federal investment base as an integral component of Hawaii's economy.*
- (b) *To achieve the federal expenditures objective, it shall be the policy of this State to:*
 - (3) *Promote the development of federally supported activities in Hawaii that respect state-wide economic concerns, are sensitive to community needs, and minimize adverse impacts on Hawaii's environment.*

Discussion: The DHHL Waiohuli Homestead Community project will receive Federal funding from the U.S. Department of Housing and Urban Development (HUD), and this

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FEA has been prepared to address potential impacts to the physical, social, and economic environment.

Section 226-10 Objective and policies for the economy – potential growth activities:

- (a) *Planning for the State's economy with regard to potential growth activities shall be directed towards achievement of the objective of development and expansion of potential growth activities that serve to increase and diversify Hawaii's economic base.*
- (b) *To achieve the potential growth activity objective, it shall be the policy of this State to:*
 - (10) *Encourage the development and implementation of joint federal and state initiatives to attract federal programs and projects that will support Hawaii's social, economic, physical, and environmental objectives.*

Discussion: This project will receive Federal and State funding to provide native Hawaiians with enhanced socio-economic opportunities through home ownership in a livable community.

Section 226-11 Objectives and policies for the physical environment – land-based, shoreline, and marine resources:

- (a) *Planning for the State's physical environment with regard to land-based, shoreline, and marine resources shall be directed towards achievement of the following objectives.*
- (2) *Effective protection of Hawaii's unique and fragile environmental resources.*
- (b) *To achieve the land-based, shoreline, and marine resources objectives, it shall be the policy of this State to:*
 - (1) *Exercise an overall conservation ethic in the use of Hawaii's natural resources.*
 - (2) *Ensure compatibility between land-based and water-based activities and natural resources and ecological systems.*
 - (3) *Take into account the physical attributes of areas when planning and designing activities and facilities.*
 - (4) *Manage natural resources and environs to encourage their beneficial and multiple use without generating costly or irreparable environmental damage.*
 - (6) *Encourage the protection of rare or endangered plant and animal species and habitats native to Hawaii.*
 - (8) *Pursue compatible relationships among activities, facilities, and natural resources.*
 - (9) *Promote increased accessibility and prudent use of inland and shoreline areas for public recreational, educational, and scientific purposes.*

Discussion: This FEA identifies the physical, archaeological, and cultural attributes of the Waiohuli Homestead Community site. Several surveys of the site were conducted, and features such as slope, soil, streams and drainage, archaeological sites, and fauna were identified. Potential impacts resulting from the project have been identified throughout this FEA, which also reports on proposed mitigation measures. Proposed infrastructure improvements will better control runoff and erosion (compared to existing conditions under which the land is used for cattle grazing). Since the Waiohuli Homestead Community site is located in Upcountry, away from the shoreline, it is not expected to have a significant impact on coastal or marine resources.

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Section 226-12 Objective and policies for the physical environment – scenic, natural beauty, and historic resources:

- (a) *Planning for the State's physical environment shall be directed towards achievement of the objective of enhancement of Hawaii's scenic assets, natural beauty, and multi-cultural/historical resources.*
- (b) *To achieve the scenic, natural beauty, and historic resources objective, it shall be the policy of this State to:*
 - (1) *Promote the preservation and restoration of significant natural and historic resources.*
 - (3) *Promote the preservation of views and vistas to enhance the visual and aesthetic enjoyment of mountains, ocean, scenic landscapes, and other natural features.*
 - (4) *Protect those special areas, structures, and elements that are an integral and functional part of Hawaii's ethnic and cultural heritage.*
 - (5) *Encourage the design of developments and activities that complement the natural beauty of the islands.*

Discussion: As further discussed in Sections 4.8 and 4.9, the project site is dominated by various introduced plant and animal species. The U.S. Fish and Wildlife Service has not designated any critical habitat areas within the Kēōkea/Waiohuli tract; however, according to a *Maui News* article (Monson 2002), the Pu'u-o-kali cinder cone and a surrounding area totaling 236 acres within the tract (but outside of the project area) is home to a diverse native Hawaiian ecosystem. This dryland forest area is outside of the project site and includes the last intact Wiliwili forest in the islands, lama trees, and other native trees and shrubs. DHHL licensed the Tri-Isle Resource Conservation Development Council to protect and restore the forest in this area. Within the 523-acre project site, only 196 acres are proposed for residential development. The remaining lands are proposed for archaeological/cultural preserves (100 acres), ranching/grazing (100 acres), and open space (125 acres).

Section 226-15 Objectives and policies for facility systems – solid and liquid wastes:

- (a) *Planning for the State's facility systems with regard to solid and liquid wastes shall be directed towards achievement of the following objectives:*
 - (1) *Maintenance of basic public health and sanitation standards relating to treatment and disposal of solid and liquid wastes.*

Discussion: The Makawao-Pukalani-Kula region is not currently serviced by a County wastewater treatment system. A variance to allow the use of individual waste disposal systems within the proposed Waiohuli Homestead Community was granted by the DOH on August 26, 2004. Conditions under which the variance was granted will mitigate potential impacts. These conditions are discussed in Section 6.3 of this EA. Solid waste will be collected by the County and taken to the Central Maui Landfill.

Section 226-16 Objective and policies for facility systems – water:

- (a) *Planning for the State's facility systems with regard to water shall be directed towards achievement of the objective of the provision of water to adequately accommodate domestic, agricultural, commercial, industrial, recreational, and other needs within resource capacities.*

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- (b) *To achieve the facility systems water objective, it shall be the policy of this State to:*
 - (1) *Coordinate development of land use activities with existing and potential water supply.*

Discussion: On December 8, 1997, the DHHL and the DWS executed a Memorandum of Understanding (MOU) to cooperate with each other and construct water system improvements to provide potable water to DHHL's lands at Waiohuli and Kēōkea for residential development. The DHHL constructed a new 18-inch water transmission main from Nā'alaē Road to Waiohuli, two (2) new booster pumps in the vicinity of the existing Kula Kai water tank, and three (3) new reservoirs, two (2) new pumps, and distribution lines in the Kula Residential subdivision, while the DWS constructed a new in-line booster pump station and a new 2.0-MG water storage tank on the Lower Kula transmission main. Additionally, a Water Credits Agreement (WCA) between DHHL and DWS was signed on December 9, 1997. Under the terms of the WCA, the DWS will maintain the water system improvements and provide the DHHL with up to 500,000 gallons of potable water per average day (except during any drought affecting the Lower Kula area as declared by the DWS).

Section 226-19 Objectives and policies for socio-cultural advancement – housing:

- (a) *Planning for the State's socio-cultural advancement with regard to housing shall be directed toward the achievement of the following objectives:*
 - (1) *Greater opportunities for Hawaii's people to secure reasonably priced, safe, sanitary, livable homes, located in suitable environments that satisfactorily accommodate the needs and desires of families and individuals, through collaboration and cooperation between government and nonprofit and for-profit developers to ensure that more affordable housing is made available to very low-, low- and moderate-income segments of Hawaii's population.*
 - (2) *The orderly development of residential areas sensitive to community needs and other land uses.*
- (b) *To achieve the housing objectives, it shall be the policy of this State to:*
 - (1) *Effectively accommodate the housing needs of Hawaii's people.*
 - (3) *Increase homeownership and rental opportunities and choices in terms of quality, location, cost, densities, style, and size of housing.*
 - (5) *Promote design and location of housing developments taking into account the physical setting, accessibility to public facilities and services, and other concerns of existing communities and surrounding areas.*
 - (6) *Facilitate the use of available vacant, developable, and underutilized urban lands for housing.*
 - (7) *Foster a variety of lifestyles traditional to Hawaii through the design and maintenance of neighborhoods that reflect the culture and values of the community.*

Discussion: The DHHL Waiohuli Homestead Community development will provide native Hawaiians with home ownership opportunities. As beneficiaries move out of their current residences and into Waiohuli Homestead Community, the vacated units will become available to the general public, helping to ease the statewide shortage of housing. This project proposes the development of single-family residences that will be designed to reflect the character of existing surrounding neighborhoods of Upcountry.

Section 226-21 Objectives and policies for socio-cultural advancement – Education:

- (a) *Planning for the State's socio-cultural advancement with regard to education shall be directed towards achievement of the objective of the provision of a variety of educational opportunities to enable individuals to fulfill their needs, responsibilities, and aspirations:*
 - (2) *Ensure the provision of adequate and accessible educational services and facilities that are designed to meet individual and community needs.*

Discussion: The DHHL *Maui Island Plan* (PBR HAWAII 2004) designated 30 acres within the Kēōkea/Waiohuli tract for an elementary and/or intermediate school. The location and size of the facility, grade levels, and development schedule have not yet been determined.

Section 226-23 Objectives and policies for socio-cultural advancement – Leisure:

- (a) *Planning for the State's socio-cultural advancement with regard to leisure shall be directed towards achievement of the objective of the adequate provision of resources to accommodate diverse, cultural, artistic, and recreational, needs for present and future generations:*

Discussion: Much of the Waiohuli Homestead Community site will remain undeveloped as open space for the preservation of archaeological sites.

Section 226-52 Statewide planning system:

- (a) *The statewide planning system shall consist of the following policies, plans, and programs:*
 - (2) *The priority guidelines established in this chapter shall provide guidelines for decision-making by the State and the counties for the immediate future and set priorities for the allocation of resources. The formulation and amendment of state functional plans shall be in conformance with the priority guidelines.*
- (b) *The statewide planning system shall also consist of several implementation mechanisms, including:*
 - (2) *The state budgetary, land use, and other decisionmaking processes. The state budgetary, land use, and other decisionmaking processes shall consist of:*
 - (D) *Land use decisionmaking processes of state agencies. Land use decisions made by state agencies shall be in conformance with the overall theme, goals, objectives, and policies, and shall utilize as guidelines the priority guidelines contained within this chapter, and the state functional plans adopted pursuant to this chapter. The rules adopted by appropriate state agencies to govern land use decisionmaking shall be in conformance with the overall theme, goals, objectives, and policies contained within this chapter.*

Discussion: The DHHL Waiohuli Homestead Community project complies with the guidelines established by the *Hawaii State Plan* and *State Functional Plans* regarding the statewide planning system and the land use decision-making process.

Section 226-103 Economic priority guidelines:

- (f) *Priority guidelines for energy use and development:*

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- (1) *Encourage the development, demonstration, and commercialization of renewable energy resources.*
- (2) *Initiate, maintain, and improve energy conservation programs aimed at reducing energy waste and increasing public awareness of the need to conserve energy.*

Discussion: Solar water heating and other energy-efficient devices will be incorporated into the various structures on the property.

Section 226-104 Population growth and land resources priority guidelines:

- (a) *Priority guidelines to effect desired Statewide growth and distribution:*
 - (1) *Encourage planning and resource management to insure population growth rates throughout the State that are consistent with available and planned resource capacities and reflect the needs and desires of Hawaii's people.*
- (b) *Priority guidelines for regional growth distribution and land resource utilization:*
 - (6) *Direct future urban development away from critical environmental areas or impose mitigating measures so that negative impacts on the environment would be minimized.*
 - (12) *Utilize Hawaii's limited land resources wisely, providing adequate land to accommodate projected population and economic growth needs while ensuring the protection of the environment and the availability of the shoreline, conservation lands, and other limited resources for future generations.*

Discussion: Population projections indicate that the Maui County population will increase from 139,573 people in 2005 to 175,136 people in 2020, a 25.5 percent increase (SMS 2002). The *Maui Island Plan* beneficiary survey indicated that the majority of the beneficiaries (39.2 percent) preferred the Upcountry region for a residential homestead. Approximately 1,107 units are needed in Upcountry to meet the beneficiary demand. Of the Upcountry lands that are in the DHHL inventory, Kēōkea/Waiohuli presents the best opportunity to develop residential homesteads and meet the beneficiary demand. The Waiohuli Homestead Community will include 337 single-family residential units.

The Waiohuli Homestead Community site is not a critical environment, although the Pu'u-o-kali cinder cone and a surrounding area totaling 236 acres within the larger Kēōkea/Waiohuli tract is home to a diverse native Hawaiian ecosystem. This dryland forest area includes the last intact Wiliwili forest in the islands, luma trees, and other native trees and shrubs. The DHHL licensed the Tri-Isle Resource Conservation Development Council to protect and restore the forest in this area.

The project is not expected to negatively impact the shoreline, conservation lands, or other limited resources and will provide single-family residences to eligible native Hawaiian homestead beneficiaries, helping to accommodate the projected population growth and address the demand for new housing.

No significant potable groundwater resources or recharge areas are associated with the site, and best management practices will be employed during construction to mitigate potential erosion, which has the potential for impacting air and water quality. Mitigation

measures for other potential impacts resulting from this project have been identified in this EA. Any historic and cultural sites encountered during the construction period will be treated in accordance with accepted standards and regulations of the State Department of Land and Natural Resources (DLNR) Historic Preservation Division (SHPD).

Section 226-106 Affordable housing:

(b) *Priority guidelines for the provision of affordable housing:*

- (1) *Seek to use marginal or nonessential agricultural land and public land to meet housing needs of low- and moderate-income and gap-group households.*
- (2) *Encourage the use of alternative construction and development methods as a means of reducing production costs.*
- (4) *Create incentives for development which would increase home ownership and rental opportunities for Hawaii's low- and moderate-income households, gap-group households, and residents with special needs.*
- (7) *Encourage improved coordination between various agencies and levels of government to deal with housing policies and regulations.*

Discussion: The DHHL Waiohuli Homestead Community development will use public land and will provide home ownership opportunities for eligible native Hawaiians. As DHHL beneficiaries move to the Waiohuli Homestead Community, the vacated residences will become available to the general public, thus helping to ease the statewide shortage of housing.

3.1.3 Chapter 226, Hawaii Revised Statutes – State Functional Plans

The *Hawaii State Plan* is primarily guided by the *State Functional Plans* (Chapter 226, HRS) and implemented by the State Department of Budget and Finance and the LUC. *State Functional Plans*, prepared by various State agencies with citizen input, provide specific recommendations for action. The areas addressed by the plans are: agriculture, conservation lands, education, employment, energy, health, higher education, historic preservation, housing, human services, recreation, tourism, and transportation. The following describes how the DHHL Waiohuli Homestead Community project complies with applicable *State Functional Plans*.

Historic Preservation Functional Plan

According to the *Historic Preservation Functional Plan*, the preservation of historic properties involves three major areas of activity: the identification, protection, and management and treatment of historic properties. The policies in the *Historic Preservation Functional Plan* are aimed primarily toward government action to provide mechanisms for improving the State's inventory, preservation systems, public access, and public awareness programs on archaeological matters.

Discussion: An archaeological inventory survey was completed for the Kēōkea/Waiohuli tract and has been coordinated with the SHPD to address appropriate mitigation measures and preservation efforts. This survey was accepted by the SHPD in 1997. In addition, a

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data recovery plan was completed and accepted by the SHPD in June 2004, and an inventory survey of proposed roadway corridors is included in Appendix D. Other plans to mitigate impacts to archaeological resources include the preparation of a preservation plan to assess all sites to be preserved, a burial treatment plan for the five known burial sites, and a monitoring plan for all infrastructure work that could identify burials. Much of the 523-acre site will remain undeveloped to preserve significant archaeological sites.

Housing Functional Plan

The State *Housing Functional Plan*, prepared by the State Housing Finance and Development Corporation (now Housing and Community Development Corporation of Hawaii), addresses six major areas of concern: 1) increasing home ownership; 2) expanding rental housing opportunities; 3) expanding rental housing opportunities for the elderly and other special need groups; 4) preserving housing stock; 5) designating and acquiring land that is suitable for residential development; and 6) establishing and maintaining a housing information system. The majority of the objectives, policies, and implementing actions of the State Housing Functional Plan apply to the government sector.

Objective A: *Homeownership for at least sixty percent, or roughly 248,500 households by the year 2000.*

Strategy: *Expand the supply of affordably priced residential units through joint public/private sector efforts. Mobilize resources to better assist families seeking home ownership opportunities. Alternate or Innovative approaches to developing housing should also be pursued.*

Policy A(1): *Direct Federal, State and county resources and efforts toward the development of affordable for-sale housing units.*

Policy A(2): *Encourage increased private sector participation in the development of affordable for-sale housing units.*

Policy A(3): *Ensure that (1) housing projects and (2) projects which impact housing provide a fair share/adequate amount of affordable home ownership opportunities.*

Policy A(4): *Assist first time home buyers in purchasing a home.*

Policy A(5): *Use alternative approaches in providing affordable housing for sale.*

Discussion: The DHHL Waiohuli Homestead Community project proposes the development of single-family residences, with large open space areas remaining undeveloped to preserve archaeological sites. The project will direct Federal and State resources and efforts to the development of for-sale housing units and assist first-time home buyers in purchasing homes. Housing opportunities afforded by this project will stimulate and promote increased housing choices for Hawai'i's citizens, directly to eligible native Hawaiians and indirectly to the general population as residences become available when DHHL beneficiaries move out of their current residences and onto homestead lots.

The project will add to the housing inventory, thus helping to stabilize the price, overall quality, location, style, and size of housing in Hawai'i. The proposed Waiohuli Homestead Community will also satisfy the beneficiary desire and demand for homes in Upcountry Maui.

Agriculture Functional Plan

The *Agriculture Functional Plan* seeks to increase the overall level of agricultural development in Hawaii, in accordance with the two fundamental Hawaii State Plan objectives for agriculture: 1) continued viability of Hawaii's sugar and pineapple industries, and 2) continued growth and development of diversified agriculture throughout the State.

Discussion: Within the Kēōkea/Waiohuli tract, the 351-acre Kēōkea Agricultural Lots – Unit 1 is located directly south of the Waiohuli Homestead Community site. The proposed residential uses adjacent to these subsistence agricultural uses are not expected to adversely impact agricultural activities.

Employment Functional Plan

The policies and recommended actions in the *Employment Functional Plan* center around the development and improvement of career/job training programs, the expansion of the labor pool, and the improvement of quality of life for workers.

Discussion: The proposed Waiohuli Homestead Community project will generate direct, indirect, and induced construction-related jobs, both within the property and on an island-wide and statewide basis. Construction industries, as well as industries supporting construction, will benefit from the employment and economic opportunities provided by the project. Once the project is completed, DHHL beneficiaries are likely to spend money on home improvements and will either purchase materials and do the work themselves or hire contractors to do the work.

Energy Functional Plan

The *Energy Functional Plan* outlines policies to promote energy efficiency, displace fossil fuel consumption, support public education and legislation on energy, and better develop and manage energy.

Solar water heating and other energy-efficient devices will be incorporated into the various structures within the proposed Waiohuli Homestead Community. Provisions for insulation and natural ventilation of proposed structures will also promote energy efficiency. The State's Model Energy Code will be considered during the detailed design phases of project development.

Recreation Functional Plan

The *Recreation Functional Plan* addresses government action toward the acquisition of recreation areas and accesses, the establishment and development of areas and facilities, and the management and usage of recreation resources.

Discussion: Recreational facilities are planned within the greater DHHL Kēōkea/Waiohuli tract; however, no recreational facilities are proposed on the Waiohuli Homestead Community site, as the DHHL is exempt from the County subdivision park requirements of Section 18.16.320, Maui County Code. As previously discussed, under the HHCA, Hawaiian home lands are not subject to land use controls by the State or County. A 2.5-acre park is proposed within the Kula Residential Lots.

Transportation Functional Plan

The overall objective of the *Transportation Functional Plan* is to provide for the efficient, safe, and convenient movement of people and goods. The *Transportation Functional Plan* is implemented as a short- to mid-term action agenda by the State Department of Transportation (DOT). It identifies four key issue areas as the most critical concerns relating to transportation in Hawaii. They are: (1) Congestion, (2) Economic Development, (3) Funding, and (4) Education. The following objectives, policies, and actions have the most relevance to the Waiohuli Homestead Community.

Objective I.A: *Expansion of the transportation system.*

Policy I.A.1: *Increase transportation capacity and modernize transportation infrastructure in accordance with existing master plans and laws requiring accessibility for people with disabilities.*

Policy I.A.2: *Improve regional mobility in areas of the State experiencing rapid urban growth and road congestion.*

Objective I.B: *Reduction of travel demand through zoning and decentralization initiatives.*

Policy I.B.1: *Close the gap between where people live and work through decentralization, mixed zoning, and related initiatives.*

Discussion: The Kula Residential Lots have two existing access points onto Kula Highway. The Waiohuli Homestead Community project proposes a mid-level road that connects Waiohuli and Kēōkea roughly at the 2,500-foot elevation. This mid-level road will provide multiple access points to the DHHL Upcountry land holdings.

There is also an internal network of roadways serving the existing Kula Residential Lots. The roadways are paved right-of-ways without curbs, gutters, or sidewalks, which conforms to County rural standards. Drainage is handled via drains located in the paved swales adjacent to the roadways.

3.1.4 Section 205A, Hawaii Revised Statutes – Coastal Zone Management Program

The objectives of the Coastal Zone Management (CZM) Program are to provide the public with recreational opportunities, protect historic and prehistoric resources, protect scenic and open space resources, protect coastal ecosystems, provide facilities for economic development, reduce hazards, and manage development. Program objectives applicable to the DHHL Waiohuli Homestead Community project are discussed below.

Recreational Resources

Objective: *Provide coastal recreational opportunities accessible to the public.*

Policies:

- (B) *Provide adequate, accessible, and diverse recreational opportunities in the coastal zone management area by:*
 - (i) *Protecting coastal resources uniquely suited for recreation activities that cannot be provided in other areas.*
 - (iii) *Providing and managing adequate public access, consistent with conservation of natural resources, to and along shorelines with recreational value.*
 - (iv) *Providing an adequate supply of shoreline parks and other recreational facilities suitable for public recreation.*
 - (vii) *Developing new shoreline recreational opportunities, where appropriate, such as artificial lagoons, artificial beaches, and artificial reefs for surfing and fishing.*
 - (viii) *Encouraging reasonable dedication of shoreline areas with recreational value for public use as part of discretionary approvals or permits by the land use commission, board of land and natural resources, and county authorities; and crediting such dedication against the requirements of section 46-6.*

Discussion: The DHHL Waiohuli Homestead Community is well inland from the coastline and will not impact access to coastal recreational opportunities.

Historic Resources

Objective: *Protect, preserve, and where desirable, restore those natural and man made historic and prehistoric resources in the coastal zone management area that are significant in Hawaiian and American history and culture.*

Policies:

- (A) *Identify and analyze significant archaeological resources;*
- (B) *Maximize information retention through preservation of remains and artifacts or salvage operations; and*
- (C) *Support state goals for protection, restoration, interpretation, and display of historic resources.*

Discussion: An archaeological inventory survey was completed for this project and has been coordinated with the SHPD to address appropriate mitigation measures and preservation efforts. The SHPD is reviewing the preparation of data recovery and preservation plans to preserve the integrity of archaeological sites.

Scenic and Open Space Resources

Objective: *Protect, preserve, and where desirable, restore or improve the quality of coastal scenic and open space resources.*

Policies:

- (B) *Ensure that new developments are compatible with their visual environment by designing and locating such developments to minimize the alteration of natural landforms and existing public views to and along the shoreline.*
- (C) *Preserve, maintain, and where desirable, improve and restore shoreline open space and scenic resources.*
- (D) *Encourage those developments that are not coastal dependent to locate in inland areas.*

Discussion: The Waiohuli Homestead Community site is located outside of the Special Management Area, away from the shoreline, and on the slopes of Haleakalā in Upcountry Maui. This region has extensive open space and rolling green hills with the summit of Haleakalā rising above the region to the east. To the west are views of the ocean and the West Maui Mountains. Coastal and ocean views are also visible to the north and south.

The historic and archaeological context of the Kēōkea/Waiohuli area and the surrounding region indicates a once active community that used the land for agricultural, residential, and religious purposes. The conversion of the land to agricultural and residential use to replace more recent cattle grazing and other agricultural use is consistent with the area's past use for similar purposes.

Coastal Ecosystems

Objective: *Protect valuable coastal ecosystems, including reefs, from disruption and minimize adverse impacts on all coastal ecosystems.*

Policies:

- (B) *Improve the technical basis for natural resource management.*
- (C) *Preserve valuable coastal ecosystems, including reefs, of significant biological or economic importance.*
- (D) *Minimize disruption or degradation of coastal water ecosystems by effective regulation of stream diversions, channelization, and similar land and water uses, recognizing competing water needs.*
- (E) *Promote water quantity and quality planning and management practices that reflect the tolerance of fresh water and marine ecosystems and maintain and enhance water quality through the development and implementation of point and nonpoint source water pollution control measures.*

Discussion: Although the DHHL Waiohuli Homestead Community project is located away from the shoreline, its development will incorporate measures to mitigate any water quality impacts from surface runoff in accordance with applicable State DOH drainage regulations.

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Waiohuli Gulch crosses the northern portion of the site. Proposed residential lots will be located away from the gulch. When rainfall is heavy enough to produce overland flow, water sheet flows and enters natural drainage ways and gulches. No adverse drainage impacts are anticipated, as both temporary and permanent erosion and sedimentation control measures would be implemented. Best management practices and erosion control measures will also be implemented during construction activities.

Economic Uses

Objective: *Provide public or private facilities and improvements important to the State's economy in suitable locations.*

Policies:

- (A) *Ensure that coastal dependent development such as harbors and ports, and coasted related development such as visitor industry facilities and energy generating facilities, are located, designed, and constructed to minimize adverse social, visual, and environmental impacts in the coastal zone management area.*
- (B) *Direct the location and expansion of coastal dependent developments to areas presently designated and used for such developments and permit reasonable long-term growth at such areas, and permit coastal dependent development outside presently designated areas when:*
 - (ii) *Adverse environmental effects are minimized.*

Discussion: The proposed Waiohuli Homestead Community will not be a coastal dependent development. Since the site is located well inland, existing coastal areas are not likely to be affected by the project.

Coastal Hazards

Objective: *Reduce hazard to life and property from tsunami, storm waves, stream flooding, erosion, subsidence, and pollution.*

Policies:

- (B) *Control development in areas subject to storm wave, tsunami, flood, erosion, hurricane, wind, subsidence, and point and nonpoint source pollution hazards.*
- (C) *Ensure that developments comply with requirements of the Federal Flood Insurance Program.*
- (D) *Prevent coastal flooding from inland projects.*

Discussion: The DHHL Waiohuli Homestead Community is not anticipated to be affected by tsunami, as it is located away from the shoreline and out of the tsunami evacuation zone. The Flood Insurance Rate Map indicates that Kēōkea/Waiohuli is located in Zone C, which includes areas of minimal flooding (Figure 6).

Managing Development

Objective: *Improve the development review process, communication and public participation in the management of coastal resources and hazards.*

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Policies:

- (A) *Use, implement, and enforce existing law effectively to the maximum extent possible in managing present and future coastal zone development;*
- (B) *Facilitate timely processing of applications for development permits and resolve overlapping or conflicting permit requirements; and*
- (C) *Communicate the potential short- and long-term impacts of proposed significant coastal developments early in their life-cycle and in terms understandable to the public to facilitate public participation in the planning and review process.*

Discussion: All improvements will be developed in accordance with all Federal, State, and County requirements and standards affecting health and safety.

Public Participation

Objective: *Stimulate public awareness, education, and participation in coastal management.*

Policies:

- (A) *Promote public involvement in coastal zone management processes.*
- (C) *Organize workshops, policy dialogues, and site-specific mediations to respond to coastal issues and conflicts.*

Discussion: This FEA reports on the potential short- and long-term impacts of the proposed Waiohuli Homestead Community project. Prior to and throughout the development of this FEA, various agencies (or agency documents) were consulted (see consultation list in Chapter 10.0). The DEA was distributed to various agencies and submitted to the OEQC, commencing a 30-day public review period that ended on July 7, 2005.

Beach Protection

Objective: *Protect beaches for public use and recreation.*

Policies:

- (A) *Locate new structures inland from the shoreline setback to conserve open space, minimize interference with natural shoreline processes, and minimize loss of improvements due to erosion.*
- (C) *Minimize the construction of public erosion-protection structures seaward of the shoreline.*

Discussion: The DHHL Waiohuli Homestead Community development will be located inland and will not interfere with natural shoreline processes.

Marine Resources

Objective: *Promote the protection, use, and development of marine and coastal resources to assure their sustainability.*

Policies:

- (A) *Ensure that the use and development of marine and coastal resources are ecologically and environmentally sound and economically beneficial.*
- (B) *Coordinate the management of marine and coastal resources and activities to improve effectiveness and efficiency.*

Discussion: As a development located away from the shoreline, the proposed Waiohuli Homestead Community is not expected to have an impact on marine and coastal resources.

3.2 COUNTY OF MAUI

County-specific land use plans and ordinances pertaining to the proposed Waiohuli Homestead Community include the *General Plan of the County of Maui 1990 Update (General Plan)*, the *Makawao-Pukalani-Kula Community Plan*, and the Maui County Code. The following subsections present relevant elements of these guidelines and regulations, accompanied with a description of how each will be addressed during the course of the proposed project.

3.2.1 General Plan

As required by the County of Maui Charter, the *General Plan* sets forth the desired sequence, patterns, and characteristics of future development. This is accomplished through long-range objectives focusing on the social, economic, and environmental effects of development coupled with specific policies designed to implement the objectives.

Specific objectives and policies applicable to the proposed Waiohuli Homestead Community are discussed below.

Land Use

Objective 1: *To preserve for present and future generations existing geographic, cultural and traditional community lifestyles by limiting and managing growth through environmentally sensitive and effective use of land in accordance with the individual character of the various communities and regions of the County.*

Policies:

- (B) *Provide and maintain a range of land use districts sufficient to meet the social, physical, environmental and economic needs of the community.*
- (C) *Identify and preserve significant historic and cultural sites.*

Objective 2: *To use the land within the County for the social and economic benefit of all the County's residents.*

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Policies:

- (A) *Mitigate environmental conflicts and enhance scenic amenities, without having a negative impact on natural resources.*
- (D) *Support the Department of Hawaiian Home Lands' development of homestead lands.*

Discussion: The Waiohuli Homestead Community will preserve for present and future generations existing geographic and traditional community lifestyles by providing housing for native Hawaiian beneficiaries. A large area of the project site will remain in its existing condition to preserve significant historical, cultural, and archaeological sites.

Environment

Objective 1: *To preserve and protect the County's unique and fragile environmental resources.*

Policies:

- (A) *Preserve for present and future generations the opportunity to experience the natural beauty of the islands.*
- (B) *Preserve scenic vistas and natural features.*
- (D) *Support programs to protect rare and endangered species and programs which will enhance their habitat.*

Objective 2: *To use the County's land-based physical and ocean-related coastal resources in a manner consistent with sound environmental planning practice.*

Policy:

- (B) *Evaluate all land-based development relative to its impact on the County's land and ocean ecological resources.*

Discussion: According to the Hawaii Natural Heritage Program *Biological Conservation Datasystem (BCD)* for Department of Hawaiian Home Lands and the U.S. Fish and Wildlife Service (USFWS), five endangered species and one candidate endangered species are found in the Kēōkea/Waiohuli tract (but outside of the proposed project area). These species are:

- *Canavalia pubescens*, 'Āwikiwiki (Candidate Endangered Species);
- *Abutilon menziesii*, Ko'olua'ula (Endangered Species);
- *Bonamia menziesii* (Endangered Species);
- *Hibiscus brackenridgei*, *ssp. brackenridgei*, Ma'o Hau Hele (Endangered Species);
- *Lasiurus cinereus semotus*, 'Ōpe'ape'a, Hawaiian Hoary Bat (Endangered Species); and
- *Manduca blackburni*, Blackburn's Sphinx Moth (Endangered Species).

The USFWS has not designated any critical habitat areas within the Kēōkea/Waiohuli tract. However, the Pu'u-o-kali cinder cone and a surrounding area totaling 236 acres within the tract (but outside of the project area) are home to a diverse native Hawaiian ecosystem. This dryland forest area includes the last intact Wiliwili forest in the islands, lama trees, and other native trees and shrubs. The DHHL has licensed the Tri-Isle Resource Conservation Development Council to protect and restore the forest in this area.

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The vegetation within the 523-acre project site is dominated by introduced and evasive species, some of which will be removed for construction within the 196 acres proposed for residential development.

Cultural Resources

Objective 1: *To preserve for present and future generations the opportunity to know and experience the arts, culture and history of Maui County.*

Policies:

- (B) *Encourage the recordation and preservation of all cultural and historic resources, to include culturally significant natural resources.*
- (C) *Establish programs to restore, maintain and interpret significant cultural districts, sites and artifacts in both natural and museum settings.*
- (D) *Encourage the rehabilitation and adaptive use and reuse of historic districts, sites and buildings in order to perpetuate traditional community character and values.*
- (E) *Identify and maintain an inventory of significant and unique cultural resources for special protection.*

Discussion: The DHHL Kēōkea/Waiohuli tract is rich in Hawaiian culture and history. Early Hawaiian settlement is evident from the large numbers of archaeological sites in the region, including recorded and unrecorded *heiau*, stone walls, building platforms, and petroglyphs.

The historic and archaeological context of the Kēōkea/Waiohuli area and the surrounding region indicates a once active community that used the land for agricultural, residential, and religious purposes. Past cultural practices associated with the property relate to gathering, religious, and day-to-day activities. Over the past century, the property has been leased out by the DHHL for cattle grazing and agricultural uses.

A cultural impact assessment was conducted for the *Kēōkea Agricultural Lots – Unit 1 Final Environmental Assessment* (SSFM 2001), which is adjacent to and south of the proposed Waiohuli Homestead Community site. The assessment concluded that given the recent historical use for ranching and agriculture, Native Hawaiian cultural practices are no longer conducted on the property (Munekiyo & Hiraga 2001). The report further concluded that the conversion of the land to agricultural and residential use to replace more recent cattle grazing and other agricultural use is consistent with the area's past use for similar purposes. Moreover, the recommendations for archaeological mitigation, including site preservation, were intended to recognize the significance of past practices in the context of the property's local history. The combination of preservation, along with a land use pattern reflecting past tradition, is deemed to be appropriate in terms of recognizing the cultural practices and beliefs that once took place on the land.

Housing

Objective 1: *To provide a choice of attractive, sanitary and affordable homes for all of our residents.*

Policy:

- (A) *Provide or require adequate physical infrastructure to meet the demands of present and planned future affordable housing needs.*

Discussion: The mission of the DHHL is to effectively manage the Hawaiian Home Lands trust and to develop and deliver land to native Hawaiians. DHHL land holdings on Maui total more than 31,000 acres. The *Maui Island Plan* was prepared to examine infrastructure needs and opportunities from an island-wide perspective. The plan also examined beneficiary needs and demands, proposed plans for both homesteading and non-homesteading uses, and estimated costs for both on- and off-site infrastructure. Based on these findings, the plan identified priority areas for homestead development.

Information provided by the *Maui Island Plan* enables the DHHL to better coordinate its developments with State, County, and private sector plans and activities (i.e., plans for roads and highways, sewage treatment, and water development).

Urban Design

Objective 1: *To see that all developments are well designed and are in harmony with their surroundings.*

Policy:

- (A) *Require that appropriate principles of urban design be observed in the planning of all new developments.*

Objective 2: *To encourage developments which reflect the character and the culture of Maui County's people.*

Policy:

- (B) *Encourage community design that will establish a cohesive identity.*

Discussion: Where necessary, archaeological sites will be preserved, fulfilling the objective to see that all developments are well designed and in harmony with their surroundings. The Waiohuli Homestead Community will also incorporate appropriate principles of urban design.

Water

Objective 1: *To provide an adequate supply of potable and irrigation water to meet the needs of Maui County's residents.*

Policy:

- (G) *Seek new sources of water by exploration in conjunction with other government agencies.*
(J) *Support the planning, preservation and development of water resources and systems which service Hawaiian Home Lands.*

Discussion: The number of lots that can be developed for the Waiohuli Homestead Community will be limited by the supply of water available under the 500,000-gpd Water Credits Agreement between the DHHL and the DWS.

A second water source is needed for the development of an additional 764 units to meet the DHHL beneficiary demand of 1,107 total units in the Upcountry region. An alternative strategy to meeting this water demand would be to develop an on-site private water system. An exploratory well at the 1,900-foot elevation of the Kēōkea/Waiohuli tract located water at approximately six feet above sea level. Further hydrological studies of the aquifer conditions and well capacity, which would include drilling and testing a new well, will be required to determine the quality and quantity of the water. A new 18-inch diameter cased well is assumed to be able to produce approximately 1.0 MGD. Utilizing the design criteria set forth by the DWS, multiple wells will be required to supply the additional 764 units (C. Takumi Engineering 2003).

Public Utilities and Facilities

Objective 2: *To improve the quality and availability of public facilities throughout Maui County.*

Policies:

- (A) *Encourage the design of multi-purposed public facilities accessible to all age groups and the handicapped.*
- (B) *Continue the development of community centers throughout the County.*

Discussion: Currently, the Waiohuli Homestead Community has no significant infrastructure facilities. Infrastructure improvements (i.e., roadways, individual septic tanks, and drainage systems) will be provided for the project. The DHHL *Maui Island Plan* (PBR HAWAII 2004) designated 30 acres within the Kēōkea/Waiohuli tract for an elementary and/or intermediate school. The location and size of the facility, grade levels, and development schedule have not yet been determined. The proposed project site is located near public facilities in Kula, such as the Kula Community Center. All telecommunication infrastructure including underground conduits, handholes, and cabling will be installed by Sandwich Isles Communications, Inc. at no cost to the DHHL.

Recreation and Open Space

Objective 1: *To provide high-quality recreational facilities to meet the present and future needs of our residents of all ages and physical ability.*

Policies:

- (B) *Maintain recreational facilities for both active and passive pursuits.*
- (C) *Maintain the natural beauty of recreational areas.*
- (D) *Develop facilities that will meet the different recreational needs of the various communities.*
- (E) *Expand, improve and create new beach rights-of-way, parks, campsites, and other facilities designated for family use.*

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Objective 2: *To provide a wide range of recreational, cultural and traditional opportunities for all our people.*

- (C) *Encourage the availability of public facilities for both cultural and recreational activities.*
- (D) *Foster an increased awareness of the ethnic and cultural heritage of our people.*
- (E) *Encourage the identification, restoration, and preservation of important archaeological, historical and cultural sites.*
- (H) *Support Federal, State and County and community initiatives to preserve open space, expand recreational facilities and provide after school programs for youth.*
- (I) *Encourage the use of public lands to expand and enhance outdoor recreational and cultural opportunities.*

Discussion: Approximately 196 acres of the 523-acre Waiohuli Homestead Community site will be developed. Approximately 125 acres will be maintained as open space, and 100 acres will be designated for archaeological/cultural preserves and 100 acres for ranching and grazing.

Special Programs

Objective 1: *To create a community in which the needs of all segments of the population will be recognized and met.*

Policy:

- (B) *Support Federal, State and County programs and services designed to improve the general welfare and conditions of Native Hawaiians.*

Discussion: The *Maui Island Plan* beneficiary survey (SMS 2003) indicated that the majority of beneficiaries (39.2 percent) preferred the Upcountry region for a residential homestead. Approximately 1,107 home sites are needed in Upcountry to meet beneficiary demand. Of the Upcountry lands that are in the DHHL inventory, the Kēōkea/Waiohuli tract presents the best opportunity to develop residential homesteads and meet the beneficiary demand.

3.2.2 Makawao-Pukalani-Kula Community Plan

The *Makawao-Pukalani-Kula Community Plan* (County of Maui 1996) is one of nine community plans for Maui County. It reflects current and anticipated conditions in the Upcountry region and advances planning goals, objectives, policies, and implementation considerations as a decision-making guide in the region through the year 2010. The *Makawao-Pukalani-Kula Community Plan* provides specific recommendations addressing the goals, objectives, and policies contained in the *General Plan*, while still recognizing the values and unique attributes of the Upcountry region. The goals, objectives, policies, and implementing actions of the *Makawao-Pukalani-Kula Community Plan* applicable to the Waiohuli Homestead Community are discussed below. Figure 5 contains the *Makawao-Pukalani-Kula Community Plan* Land Use Map.

Land Use

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Goal: *The maintenance and enhancement of Upcountry's unique and diverse rural land use character with sensitivity to existing land use patterns, natural resource values, and economic and social needs of the region's residents.*

Objectives and Policies:

- (1) *Recognize the value of open space, including agricultural lands and view planes to preserve the region's rural character.*
- (6) *Encourage new residential developments in areas which are contiguous extensions of, or infills within the established residential pattern, and which do not adversely affect agricultural uses.*
- (7) *Ensure that adequate lands are set aside for recreational and open space purposes.*
- (25) *Establish water resource availability as a major criteria in establishing land uses.*

Implementing Actions:

- (11) *Determine the need for an additional school site(s) within the planning region at the time of LUC boundary amendments and/or zoning applications for additional housing projects. Special consideration should be given in this regard to additional housing in Hali'imaile Town.*

Discussion: The proposed Waiohuli Homestead Community will be located within the DHHL Kēōkea/Waiohuli tract, which already includes the Kula Residential Lots and is planned to include the Kēōkea Agricultural Lots. As shown in Figure 3, only 196 acres of the 523-acre project site will be developed for single-family residential use. The remaining lands will be used for archaeological/cultural preserves (100 acres), ranching/grazing (100 acres), and open space (125 acres). The proposed project will provide additional residential lots within the DHHL Kēōkea/Waiohuli tract and will not adversely affect agricultural uses within the Kēōkea Agricultural Lots (south of the project site) or within the region.

Water for the Waiohuli Homestead Community would be supplied from the 500,000-gpd under the Water Credits Agreement between the DHHL and the DWS, as discussed in Sections 2.4.1 and 6.2 of this EA.

Environment

Goal: *Protection of Upcountry's natural resources and environment as a means of preserving and enhancing the region's unique beauty, serenity, ecology, and productivity, in order that future generations may enjoy and appreciate an environment of equal or higher quality.*

Objectives and Policies:

- (3) *Recognize and protect rare, endangered and unique biological resources in the region.*

Discussion: The following species found in the Kēōkea/Waiohuli tract (but outside of the proposed project area) were identified as endangered species or candidate endangered species by the Hawaii Natural Heritage Program *Biological Conservation Datasystem (BCD)* for Department of Hawaiian Homelands and the U.S. Fish and Wildlife Service (USFWS):

- *Canavalia pubescens*, 'Awikiwiki (Candidate);

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- *Abutilon menziesii*, Ko'olua'ula (Endangered);
- *Bonamia menziesii* (Endangered);
- *Hibiscus brackenridgei* ssp. *Brackenridgi*, Ma'o Hau Hele (Endangered);
- *Lasiurus cinereus semotus*, 'Ope'ape'a, Hawaiian Hoary Bat (Endangered); and
- *Manduca blackburni*, Blackburn's Sphinx Moth (Endangered).

Since these species are located outside of the project site, no impacts are anticipated. Vegetation within the 523-acre project site is dominated by introduced and evasive species.

Cultural Resources

Goal: *The identification, preservation and where appropriate, restoration and promotion of cultural resources and practices which reflect the rich and diverse heritage found in the Upcountry region.*

Objectives and Policies:

- (1) *Recognize the importance of historically and archaeologically sensitive sites, both known and undiscovered, and encourage their preservation and protection.*
- (2) *Support public and private efforts to inventory, evaluate, classify, register, and protect, as appropriate, cultural resources to increase public knowledge of the region's rich and diverse cultural character.*

Discussion: Several reports have been prepared to identify cultural and archaeological sites and mitigate potential impacts from the proposed Waiohuli Homestead Community. An archaeological inventory survey for the Kēōkea/Waiohuli tract was completed and accepted by the SHPD in 1997. A data recovery plan was also completed and accepted by the SHPD in 2004. A report for the data recovery fieldwork is currently being prepared, and a revised inventory survey (to allow proposed roadways in Waiohuli) was submitted to the SHPD in April 2005. A preservation plan, burial treatment plan, and monitoring plan will be prepared by Scientific Consultant Services, Inc. and submitted to the SHPD. There has been coordinated with the SHPD to address appropriate mitigation measures and preservation efforts. The SHPD is reviewing data recovery and preservation plans for many of the sites; therefore, the integrity of these sites would be preserved through implementation of the approved preservation plans.

Department of Hawaiian Home Lands

Goal: *The immediate implementation of programs and settlement of Native Hawaiians on lands of the Department of Hawaiian Home Lands, that diversifies and enriches the Upcountry community.*

Objectives and Policies:

- (1) *Encourage and support planning and implementation of Department of Hawaiian Home Lands projects that benefit native Hawaiians, that include a variety of land uses in order to form a complete community, and that are in harmony with the goals and objectives of the Makawao-Pukalani-Kula Community Plan.*

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- (2) *Recognize and support the allocation of water resources for Department of Hawaiian Home Lands projects, consistent with applicable State and Federal laws.*
- (3) *Encourage cooperative planning programs between the State, the County, the DHHL and the native Hawaiian community which will foster a desired lifestyle and perpetuate the culture.*
- (4) *Coordinate and integrate the development of Department of Hawaiian Home Lands' projects with surrounding Upcountry communities.*
- (5) *Encourage the development of cooperative planning programs between the State and County and the Department of Hawaiian Home Lands to ensure that infrastructure and public service needs adequately address the needs of the entire Upcountry community. For example, consideration shall be given to the identification and development of new school sites, facilities, and programs which will provide adequate choices for education for Upcountry residents.*
- (6) *Encourage the development of cooperative agricultural development programs between the County and the Department of Hawaiian Home Lands to support diversified agricultural pursuits (i.e., programs, for example, which may identify opportunities for creating efficiencies in scale which will benefit all Upcountry farmers).*
- (7) *Support educational facilities and programs development by the Department of Hawaiian Home Lands.*
- (8) *Recognize the Department of Hawaiian Home Lands' Waiohuli-Keokea region as a potential agricultural and affordable housing community and the eventuality of a Hawaiian sovereign entity.*

Implementing Actions:

- (1) *Encourage the creation of a Department of Hawaiian Home Lands-County Task Force to study and identify opportunities for developing cooperative programs and projects.*
- (2) *Develop alternate subdivision standards for infrastructure which:*
 - (a) *ensure public health, safety and welfare;*
 - (b) *are consistent with the desired lifestyle of the Native Hawaiian community;*
 - (c) *reduce construction costs; and*
 - (d) *speed the settlement of the project area.*

Discussion: The proposed Waiohuli Homestead Community project is consistent with these objectives, as it will provide homes for native Hawaiians on DHHL lands. The project will support the establishment of a community in harmony with the goals and objectives of the *Makawao-Pukalani-Kula Community Plan*. The DHHL is working with the DWS for the allocation of water resources to serve this project.

The DHHL *Maui Island Plan* (PBR HAWAII 2004) designated 30 acres within the Kēōkea/Waiohuli tract for an elementary and/or intermediate school. The location and size of the facility, grade levels, and development schedule have not yet been determined.

Physical Infrastructure

Goal: *The timely and environmentally sensitive development and maintenance of infrastructure systems which protect and enhance the safety and health of Upcountry's residents and visitors, including the provision of domestic water, utility and waste disposal services, and effective transportation systems which meet the needs of residents and visitors while maintaining the region's rural character.*

Transportation

Objectives and Policies:

- (1) *Ensure the safe and convenient movement of people and goods by providing maintained roadways having adequate carrying capacities.*
- (3) *Support the planning of new roadways provided that there would be minimal impact to the Upcountry lifestyle and character.*

Discussion: Necessary roadway improvements would be provided as part of this development. Road improvements within the existing Kula Residential Lots and the proposed Kēōkea Agricultural Lots will serve as the primary access to the proposed Waiohuli Homestead Community. A mid-level road at the 2,500-foot elevation will connect Waiohuli and Kēōkea and provide access to/from Kula Highway to/from the proposed project site through three existing access points.

These improvements would be coordinated with the State Department of Transportation (DOT) and the County Department of Public Works and Environmental Management (DPWEM), and would provide for the safe and convenient movement of people and goods.

Roadway improvements would have minimal impact to the Upcountry lifestyle and character since they only include rural-type access roadways within the project area.

Water

Objectives and Policies:

- (1) *Prioritize the allocation of water as new resources and system improvements become available as follows:*
 - (a) *for maintenance and expansion of diversified agricultural pursuits and for the Department of Hawaiian Homes projects; and then*
 - (b) *for other uses including development of new housing, commercial and public/quasi-public uses.*
- (5) *Recognize and support the immediate allocation of water resources for Department of Hawaiian Home Lands projects and agriculture.*
- (7) *Support the development of separate domestic and irrigation water systems.*

Implementing Actions:

- (2) *Increase the deliverable capacity of the lower Kula line to 7.5 mgd and extend the line to Keokea to serve Department of Hawaiian Home Lands projects.*
- (8) *Conduct a groundwater development feasibility study for the Upcountry region.*

Discussion: Currently, water from Pi'iholo is collected in the Kula Kai Reservoir. A booster station then pumps the water via an 18-inch transmission line from the Kula Kai Reservoir to Waiohuli, where it enters the Kēōkea/Waiohuli tract at an elevation of 2,615 feet. A booster pump station and three reservoirs at elevations of 3,000; 2,750; and 2,355 feet currently serve the Kula Residential Lots.

Approximately 337 units are proposed for the Waiohuli Homestead Community. A second water source is needed for the development of an additional 764 units to meet the

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beneficiary demand of 1,107 total units in the Upcountry region. An alternative strategy to meet this water need would be to develop an on-site private water system. An exploratory well at the 1,900-foot elevation within the Kēōkea/Waiohuli tract located water at approximately six feet above sea level. Further hydrological studies of the aquifer conditions and well capacity, which would include drilling and testing a new well, will be required to determine the quality and quantity of the water.

Drainage

Objectives and Policies:

- (1) Respect and preserve natural drainageways as part of good land development practices and recognize their value as open-space corridors.*
- (2) Implement comprehensive drainage improvements and maintenance procedures to ensure that the overall system will meet public safety and welfare needs of the region's residents.*

Discussion: Drainage improvements for the Waiohuli Homestead Community project site will be developed in coordination with the County DPWEM. Such improvements will recognize the value of natural drainageways as open space corridors. No adverse drainage impacts are anticipated, as both temporary and permanent erosion and sedimentation control measures would be implemented. Best management practices and compliance with erosion control measures will be adhered to during construction activities.

Housing

Goal: *Housing opportunities for the residents of Makawao-Pukalani-Kula, to include all income and age groups, which are affordable, safe, and environmentally and culturally compatible.*

Objectives and Policies

- (2) Provide increased opportunities for affordable housing through coordinated government assistance programs including the Department of Hawaiian Home Lands.*
- (5) To establish an efficient settlement pattern, discourage a dispersed pattern of development, thereby reducing public service, infrastructure and maintenance costs.*

Discussion: The Waiohuli Homestead Community will provide much needed affordable housing for native Hawaiians. An efficient settlement pattern has been incorporated into the planning and design of infrastructure improvements to serve the Kēōkea/Waiohuli tract.

Social Infrastructure

Goal: *An efficient and responsive system of people-oriented public services which enable residents to live a safe, healthy and enjoyable lifestyle, and offer the youth and adults of the region opportunities and choices for self and community improvement.*

Recreation

Objectives and Policies:

- (1) *Develop a system of parks serving dispersed residential areas, including a regional park of at least 50 acres in the Upcountry region.*
- (2) *Establish youth centers and programs at locations suitable for and accessible by the youth of the region.*
- (3) *Improve park utility and operations by expanding organized sports programs and encouraging use of facilities.*

Discussion: A 2.5-acre park is proposed within the Kula Residential Lots.

Education and Family Services

Objectives and Policies:

- (4) *Provide adequate school facilities to ensure an effective, efficient and comfortable learning environment for the region's children.*

Implementing Actions:

- (1) *Provide additional elementary schools, as required and establish a student enrollment limit of 700 for each school.*
- (2) *Provide a new intermediate school when student enrollment at Kalama Intermediate School reaches 1,200. The new intermediate school would serve students from Pukalani and Kula, with Kalama Intermediate School serving students from Makawao and Haiku.*

Discussion: The DHHL *Maui Island Plan* (PBR HAWAII 2004) designated 30 acres within the Kēōkea/Waiohuli tract for an elementary and/or intermediate school. The location and size of the facility, grade levels, and development schedule have not yet been determined.

3.2.3 Maui County Zoning

The Waiohuli Homestead Community site is zoned Agricultural. In accordance with the HHCA, Hawaiian home lands are not subject to zoning or other land use controls by the State or County.

3.3 APPROVALS AND PERMITS

During the implementation stages of the project, the applicant will be working with the State and County review agencies for examination and approval of project plans and specifications.

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Table 1. Required Permits and Approvals

Permit/Approval	Responsible Agency
Chapter 343, HRS compliance	State of Hawai'i Department of Health – Office of Environmental Quality Control
Building/Grading Permits	County of Maui Department of Public Works and Environmental Management
National Pollutant Discharge Elimination System (NPDES)	State of Hawai'i Department of Health
Department of Army Permit	U.S. Army Corps of Engineers

4.0 ASSESSMENT OF THE EXISTING NATURAL ENVIRONMENT, POTENTIAL IMPACTS, AND MITIGATION MEASURES

This chapter describes the existing natural environment associated with the property and potential impacts that may result from development of the Waiohuli Homestead Community. Mitigation measures to address potential impacts are also described, as applicable.

4.1 CLIMATE

The climate of the Kula region is typical of most upland areas in Hawai'i. Climatic conditions vary according to altitude and wind direction. The Kula region is characterized by temperate conditions with temperatures ranging from 50 degrees Fahrenheit in the winter months to about 85 degrees Fahrenheit in the summer months. The Kula region is relatively dry with annual rainfall between 20 to 30 inches. Most precipitation occurs from October to April. Prevailing winds are tradewinds from the northeast reaching speeds of 10 to 20 miles per hour. Tradewinds can be slightly stronger during the spring and summer months.

Potential Impacts and Mitigation Measures

With project build-out, there may be some localized temperature increases resulting from paved surfaces and roofs. However, it is assumed that each lot will eventually be landscaped (by lessees) with shade trees, which will help mitigate localized temperature increases from roadways and buildings. No impacts to the regional climate are anticipated.

4.2 TOPOGRAPHY AND GEOLOGY

The island of Maui is geologically characterized as East Maui and West Maui, with East Maui dominated by the Haleakalā Volcano. The Waiohuli Homestead Community is located on the windward slopes of Haleakalā, a dormant volcano that last erupted around 1790. Haleakalā was formed through three distinct periods in volcanism. The Honomanu Series formed the primitive shield of Haleakalā during the Tertiary Period. In the Pleistocene Epoch, these lavas were completely overlain by the Kula Series. Kula lavas are primarily composed of thick a'ā flows with some pahoehoe near the vents. Following a lengthy erosion period, a third series of eruptions and flows, the Hana Volcanic Series, covered much of the Kula lavas. The north rift zone of the Kula Series did not reopen during the third series volcanism, and as such, the Hana Series is absent from the entire northwestern section of East Maui, including the Waiohuli Homestead Community site.

The topography of the Kēōkea/Waiohuli tract is characterized by rolling hills that grow increasingly steep toward the mauka areas. The elevation of the Waiohuli Homestead Community site ranges from 2,250 feet mean sea level (msl) to 2,920 msl.

Potential Impacts and Mitigation Measures

Clearing and grubbing activities will be required for construction of the Waiohuli Homestead Community and related infrastructure. The project site currently consists of land used for cattle grazing, and with development of the Waiohuli Homestead Community, the site will eventually include new roadways, water storage and transmission facilities, on-site waste disposal systems, and a drainage system. Construction of drainage improvements and implementation of erosion control measures will mitigate potential short-term impacts such as soil erosion. To the extent possible, improvements will conform to the contours of the land, minimizing the area requiring extensive site grading. No impacts to the regional topography or geology are anticipated.

All construction activities will comply with the provisions of Section 11-60.1-33, HAR, on Fugitive Dust, and all grading operations will comply with dust and erosion control requirements of the County of Maui. A grading permit will be required to modify the topography and a National Pollutant Discharge Elimination System (NPDES) permit will be required prior to construction to address non-point source discharges. Appropriate engineering, design, and construction measures will be undertaken to minimize potential erosion due to grading.

4.3 DRAINAGE

Upcountry Maui is located along the upland slopes of Haleakalā and ranges in elevation from 800 to 10,000 feet msl. Most of the developed and agricultural areas in Kula are located between the 1,500- and 3,000-foot elevations. Upcountry Maui is characterized as having broad, rolling ridge tops; deep, precipitous gulches; and increasing slopes along ridges. Upcountry Maui is well-suited for smaller-scale agricultural activities, as many gulches bisect the region.

Waiohuli Gulch runs in a northwesterly direction and enters and exits the northern portion of the project site. The natural slope of the land and well-draining soils provide adequate drainage for current conditions. When rainfall is heavy enough to produce overland flow, water sheet flows in a northwesterly direction and enters Waiohuli Gulch. Runoff from Waiohuli Gulch is discharged into Waipu'ilani Gulch and ultimately the ocean. An approximately 1,020-acre drainage basin is located southeast of the Waiohuli Homestead Community site.

The Federal Emergency Management Agency classifies flood hazard zones as part of the Flood Insurance Program. The entire Waiohuli Homestead Community site (and the surrounding area) is designated Zone C (areas of minimal flooding) by the Flood Insurance Rate Map (Figure 6).

Potential Impacts and Mitigation Measures

A drainage master plan was prepared for the proposed Waiohuli Homestead Community and the planned Kēōkea Agricultural Lots by Community Planning and Engineering, Inc. This report is included in Appendix B and further discussed in Section 6.4 of this EA. Although the project will create impervious surfaces (i.e., roads and roofs) that increase runoff, proposed drainage improvements will mitigate any potential flood hazard.

4.4 SOILS

Three soil suitability studies have been prepared to describe the physical attributes of land and the relative productivity of different land types for agricultural production in Hawai'i. These studies include the University of Hawai'i – Land Study Bureau *Detailed Land Classification*, the U.S. Department of Agriculture – Natural Resources Conservation Service Soil Survey, and the State Department of Agriculture's Agricultural Lands of Importance to the State of Hawaii (ALISH) system.

Detailed Land Classification. The University of Hawai'i – Land Study Bureau developed the *Detailed Land Classification, Islands of Kauai, Oahu, Maui, Molokai, and Lanai* (1965 through 1972). The intent of these reports was to develop a land inventory and productivity evaluation based on statewide standards of crop yields and levels of management. A five-class productivity rating is applied using the letters A, B, C, D, and E, with A representing the class of highest productivity and E the lowest.

The majority of the soils on the Waiohuli Homestead Community site are rated E (very poor) (Figure 7). Other portions of the site are rated D (poor) and C (fair). A small portion at the southern boundary of the site is rated B (good).

Natural Resources Conservation Service Soil Survey. According to the U.S. Department of Agriculture *Soil Survey of the Island of Kauai, Oahu, Maui, Molokai, and Lanai, State of Hawaii* (1972), the Waiohuli Homestead Community site contains six soil types (Figure 8). These soil types are described below.

Kamaole Very Stony Silt Loam, 3 to 15 percent slopes (KGKC) – This soil is used for pasture and wildlife habitat. Permeability is moderate and runoff is slow to medium. The erosion hazard is slight to moderate.

Kamaole Extremely Stony Silt Loam, 3 to 15 percent slopes (KGLC) – This soil is similar to Kamaole Very Stony Silt Loam, 3 to 15 percent slopes, except that stones cover 3 to 15 percent of the surface. This soil is also used for pasture and wildlife habitat.

Kula Cobbly Loam, 12 to 20 percent slopes (KxaD) – This soil is used for pasture, with small areas used for truck and orchard crops. Permeability is moderately rapid and runoff is medium. The erosion hazard is moderate.

Kula Loam, 4 to 12 percent slopes (KxC) – This soil has a profile similar to that of Kula Cobbly Loam, 12 to 20 percent slopes, except that it is nearly free of cobblestones. It is used for truck crops and pasture.

Kula Loam, 12 to 20 percent slopes (KxD) – This soil has a profile similar to that of Kula Cobbly Loam, 12 to 20 percent slopes, except that it is nearly free of cobblestones. It is also used for truck crops and pasture.

Kula Very Rocky Loam, 12 to 40 percent (KxbE) – This soil has a profile similar to that of Kula Cobbly Loam, 12 to 20 percent slopes, except that rock outcrops cover 10 to 25 percent of the surface. It is used for pasture and wildlife habitat. Runoff is medium and the erosion hazard is moderate.

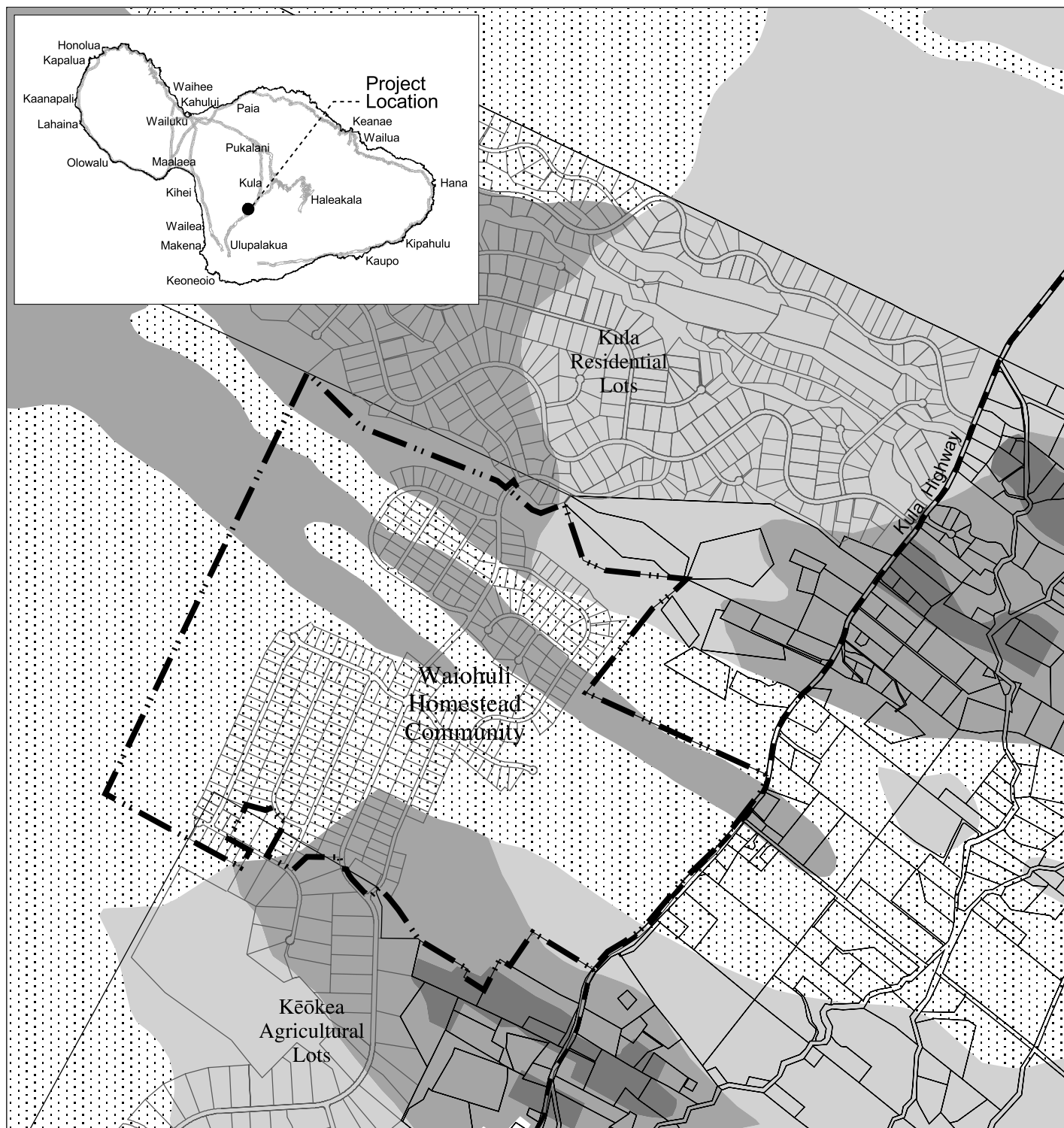
Agricultural Lands of Importance to the State of Hawaii. The Agricultural Lands of Importance to the State of Hawaii (ALISH) (1977) system identifies and maps three broad classes of agricultural land – Prime, Unique, and Other Agricultural Land. Prime Agricultural Land is defined as “land best suited for the production of food, feed, forage, and fiber crops.” This class of land has the soil quality, growing season, and moisture supply needed to economically produce sustained high yields of crops when treated and managed (including water management) according to modern farming methods. Prime Agricultural Land produces the highest yields with the lowest inputs of energy or money, and with the least damage to the environment. The two other classes are Unique Agricultural Land and Other Important Agricultural Land, which are successively less productive soils.

The majority of the lands within the Waiohuli Homestead Community site are designated Other Agricultural Land (Figure 9). Lands within the central portion of the site are not classified by the ALISH system. A small portion of land at the southern boundary of the site is designated Prime Agricultural Land.

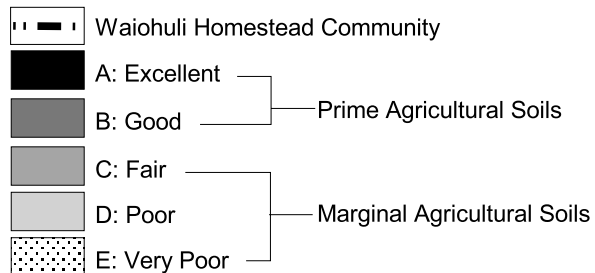
Potential Impacts and Mitigation Measures

With the proposed Waiohuli Homestead Community, the soils within the developed portion of the site will no longer be used for cattle grazing. The erosion hazard of the soils is moderate and there is potential for soil loss through the generation of dust and water-borne soil erosion as areas are graded during the construction phases. Erosion control measures and drainage improvements will further mitigate soil loss during construction and after project build-out. All grading operations will be conducted in compliance with dust and erosion control requirements and applicable provisions of Section 11-60.1-33, HAR, regarding Fugitive Dust. A watering program will be implemented during construction to minimize soil loss through fugitive dust emission. Other erosion control measures include cleaning job-site construction equipment and establishing groundcover as quickly as possible after grading. In addition to watering programs, other mitigation measures generally associated with best management practices include:

- Early construction of drainage control features;



Legend



Source:
Land Study Bureau
Community Planning and Engineering, Inc.
Austin Tsutsumi and Associates, Inc.

Disclaimer: This map has been prepared for
general planning purposes only.

Figure 7
Detailed Land Classification
Waiohuli Homestead Community

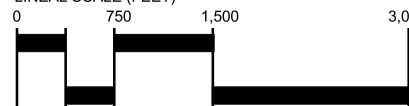
DEPARTMENT OF HAWAIIAN HOME LANDS

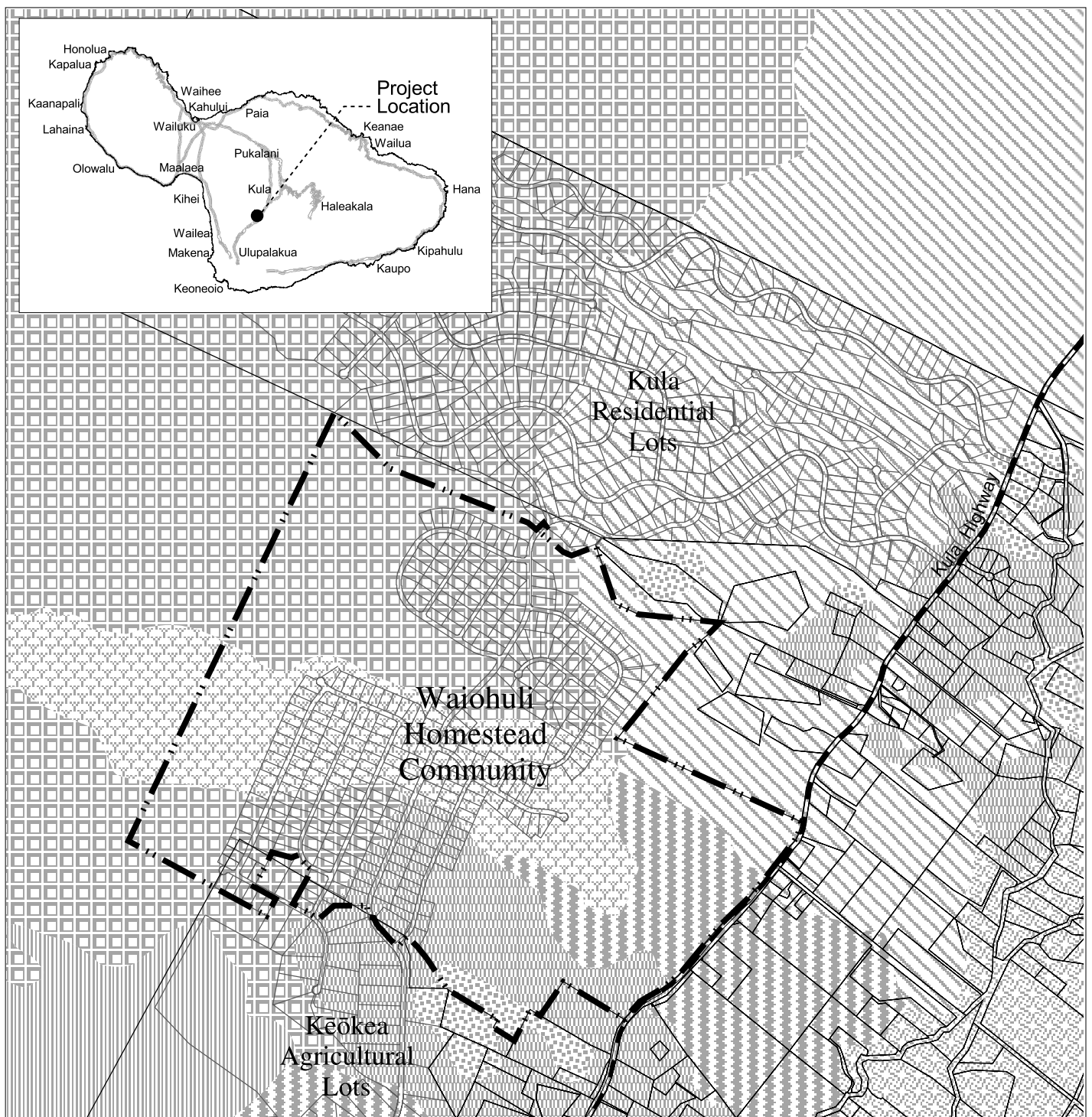
KULA, MAUI

NORTH

LINEAL SCALE (FEET)

0 750 1,500 3,000





Legend

- Waiohuli Homestead Community
- Kamaole Very Stony Silt Loam, 3-15% Slopes
- Kula Cobbly Loam, 12-20% Slopes
- Kula Loam, 12-20% Slopes
- Kula Very Rocky Loam, 12-40% Slopes
- Kula Loam, 4-12% Slopes
- Kamaole Extremely Stony Silt Loam, 3-15% Slopes

Source:
 -U.S. Department of Agriculture
 -Natural Resources Conservation Service
 -Community Planning and Engineering, Inc.
 -Austin Tsutsumi and Associates, Inc.

Disclaimer: This map has been prepared for general planning purposes only.

Figure 8
 Natural Resources Conservation Service
 Soil Survey
 Waiohuli Homestead Community

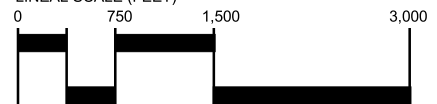
DEPARTMENT OF HAWAIIAN HOME LANDS

KULA, MAUI

NORTH




LINEAL SCALE (FEET)

0 750 1,500 3,000





Legend

-  Waiohuli Homestead Community
-  Prime Agricultural Land
-  Other Agricultural Land
-  Unclassified Land

Source:
State of Hawaii Department of Agriculture
Community Planning and Engineering, Inc.
Austin Tsutsumi and Associates, Inc.

Disclaimer: This map has been prepared for
general planning purposes only.

Figure 9
Agricultural Lands of Importance
to the State of Hawaii (ALISH)
Waiohuli Homestead Community

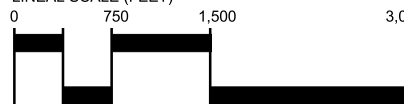
DEPARTMENT OF HAWAIIAN HOME LANDS

KULA, MAUI

NORTH

LINEAL SCALE (FEET)

0 750 1,500 3,000



- Construction of temporary sediment basins to trap silt;
- Use of temporary berms and cut-off ditches where needed; and
- Use of temporary silt fences or straw bale barriers to trap silt.

To further mitigate potential soil impacts, a NPDES permit will be required prior to construction to address non-point source discharges.

4.5 AGRICULTURAL IMPACT

The approximately 523-acre Waiohuli Homestead Community site is within the State Agricultural District (Figure 4) and is currently used for cattle grazing.

Potential Impacts and Mitigation Measures

The project site is currently used for cattle grazing under a revocable permit granted by the DHHL. Although only 196 acres of the approximately 523-acre site will be developed for the Waiohuli Homestead Community (the remaining land will be used for archaeological/cultural preserves, ranching/grazing, and open space), the proposed project could result in the loss of grazing land. However, additional agricultural land is available in the Kēōkea/Waiohuli tract and elsewhere on Maui. The limiting factor to the growth of diversified agriculture is not the land supply, but rather the size of the market for those crops than can be grown profitably in Hawai'i. Based on the ample supply of land suitable for diversified agriculture on Maui and the relative lack of market demand (compared to the supply available), no mitigation measures are proposed for the loss of agricultural land and production associated with the proposed site.

4.6 GROUNDWATER RESOURCES/HYDROLOGY

Waiohuli Gulch enters and exits the Waiohuli Homestead Community site at the northern boundary. The site overlies the Makawao Aquifer, which has a sustainable yield of 7 million gallons per day (mgd). According to the *Water Development Analysis for the Department of Hawaiian Home Lands Tracts on the Island of Maui* (2003), an exploratory well (State Well 6-4421-01) is located northwest of the Waiohuli Homestead Community site within the Kula Residential Lots – Unit 1. This well penetrates 1,940 feet below the surface and has a 7 ⁷/₈-inch diameter hole with a 4-inch steel casing, which is too small for pump testing. Between September 2001 and April 2002, water levels ranged between 5.58 and 6.11 feet msl.

The Waiohuli Homestead Community site is above (mauka) of the Underground Injection Control (UIC) line established by the State DOH. The UIC program was established to protect the quality of the State's underground sources of drinking water from pollution by subsurface disposal of fluids. According to the DOH, the underlying aquifer is considered a drinking water source and limited types of injection wells are allowed with a UIC Permit or Permit Exemption.

Potential Impacts and Mitigation Measures

All storm water entering the proposed project site must ultimately flow through the property and evaporate, discharge into the ocean, or infiltrate into the ground. To protect groundwater resources, best management practices (BMPs) for construction will be adopted, as recommended by the DOH (Chapter 10.0). BMPs will help to minimize infiltration and runoff. As recommended by the Maui County Department of Public Works and Environmental Management (DPWEM), a registered civil engineer will verify that the grading and runoff water generated by the project will not have an adverse impact on the adjacent and downstream properties (Chapter 10.0).

The proposed Waiohuli Homestead Community is mauka of the UIC line. A variance to allow the use of individual waste disposal systems was granted by the DOH in August 2004. Conditions under which this variance was granted will mitigate potential impacts to groundwater resources and hydrology.

4.7 NATURAL HAZARDS

Natural hazards are events such as tsunamis, earthquakes, floods, hurricanes, soil slippage, and volcanic hazards. The proposed Waiohuli Homestead Community may be subject to hurricanes and minor earthquakes in the future; however, the site is not unique to these potential hazards.

Earthquakes in the Hawaiian Islands are associated with volcanic eruption or tectonic movement. Maui is periodically subject to episodes of seismic activity of varying intensity. Most of the earthquakes that have occurred were volcanic earthquakes causing little or no damage. Earthquakes cannot be predicted with any degree of certainty or avoided, and an earthquake of sufficient magnitude (greater than 5 on the Richter Scale) could cause significant damage to existing developments. However, the possibility of earthquakes occurring on Maui is not considered to be high.

Since 1982, Hawai'i has been affected twice by devastating hurricanes, 'Iwa in 1982 and 'Iniki in 1992. While it is difficult to predict these natural occurrences, it is reasonable to assume that events could be likely. The project area is no more or less vulnerable than the rest of the island to the destructive winds and torrential rains associated with hurricanes and cyclones. However, since the project area is not situated in a coastal area, it is not susceptible to hurricane-related storm surge.

Flood hazards are primarily identified by the Flood Insurance Rate Map (FIRM) prepared by the Federal Emergency Management Agency (FEMA) (Figure 6). The project site is designated by the FIRM as Zone C, which includes areas of minimal flooding.

Potential Impacts and Mitigation Measures

The project site is not anticipated to be affected by tsunami, as it is located away from the shoreline, at a high elevation, and outside of the tsunami evacuation zone. Although hurricanes and earthquakes cannot be prevented, their impacts will be mitigated as the project will comply with the Uniform Building Code adopted by the County. All structures will be constructed to minimize damage from earthquakes and tropical hurricanes in accordance with County requirements.

4.8 FLORA

The deforestation of native forest to create arable land for agricultural fields and habitations, in addition to post-contact ranching, logging, and modern development has changed the landscape of Kula (Scientific Consultant Services, Inc. 2005). The Waiohuli Homestead Community site contains a variety of habitats from pastures to second growth forest with a thick understory of brush (Bruner 2004). The upper portion of the site (at the 3,000-foot elevation) is relatively wet with lush vegetation, while drier scrub lands are found at lower elevations of the site. Vegetation within the project site is dominated by introduced species such as the evasive lantana (*Lantana camara*), black wattle (*Acacia decurans*), Christmas Berry (*Schinus terebinthifolius*), *panini* or prickly pear cactus (*Opuntia megacantha*), and various grasses and secondary growth shrubs.

The U.S. Department of the Interior, Fish and Wildlife Service (USFWS) has not designated any critical habitat areas within the project site or within the larger Kēōkea/Waiohuli tract. However, according to a *Maui News* article (Monson 2002), the Pu'u-o-kali cinder cone (west of the project site) and a 236-acre area (outside and southwest of the project site but within the Kēōkea/Waiohuli tract) is home to a diverse native Hawaiian ecosystem. This dryland forest area includes the last intact Wiliwili forest in the islands, lama trees, and other native trees and shrubs.

Potential Impacts and Mitigation Measures

The Waiohuli Homestead Community site contains no known endangered or candidate endangered species. Vegetation within the project area is dominated by introduced species and bears no resemblance to what it may have looked like during the pre-contact era (Scientific Consultant Services, Inc. 2005).

Construction activities for the proposed Waiohuli Homestead Community would remove some of the introduced and evasive plant species found within the 196 acres proposed for residential development. No impacts on species outside of the project site are anticipated. About 125 acres within the approximately 523-acre site would be maintained as open space and another 100 acres would be used for archaeological/cultural preserves. The remaining lands, 100 acres, would continue to be used for ranching and grazing.

During the public comment period for the DEA, the State Office of Hawaiian Affairs

(OHA) requested that native flora be incorporated into the future landscaping plan (Chapter 10.0). Although no landscaping will be provided by the DHHL, Native Hawaiian plants (i.e., 'āwīkīwīkī, ko'oloa'ula, iliana, and ma'o hau hele) will be suggested for use by residents.

4.9 FAUNA

A faunal survey of the Waiohuli Homestead Community site was conducted in July 2004 by Phillip L. Bruner (Bruner 2004). This report is included in Appendix C. The avifaunal and feral mammal survey of the site did not observe any native or migratory birds. No rare, threatened, or endangered species were observed on the project site, and no adverse impacts to existing fauna within the project vicinity are anticipated.

Native Land Birds. No native land birds were observed during the faunal survey; however, given the location and available habitat of the project site, the Hawaiian Owl (*Asio flammeus sandichensis*), or Pueo, could occur in the area. The Pueo is listed as an endangered species on O'ahu by the State of Hawai'i. Pueo forage in agricultural and ranch lands as well as native forest, and are frequently seen on the upper slopes of Haleakalā ranch lands.

Native Water Birds. No native water birds were observed during the survey, and due to the absence of wetland habitat, native water birds are not expected to occur on the project site.

Seabirds. No seabirds were observed, although the endangered Dark-rumped Petrel (*Pterodroma phaeopygia sandwichensis*), or Ua'a, may fly over the site between the sea and higher elevations of Haleakalā.

Migratory Shorebirds. No migratory shorebirds were observed during the survey, which was conducted when birds are at breeding grounds in the arctic. Between August and late April, the Pacific Golden Plover (*Pluvialis fulva*), or Kolea, is expected to be found foraging for insects on pastures within the site. No other migratory shorebirds are expected to occur on the site.

Introduced Birds. Sixteen introduced birds were observed during the survey, none of which are threatened or endangered.

Mammals. Four Axis Deer (*Axis axis*), two feral pigs (*Sus scrofa*), three feral cats (*Felis catus*), and seven Small Indian Mongoose (*Herpestes auropunctatus*) were observed during the survey. No rats or mice were observed, but undoubtedly these mammals occur on the property. None of these mammals are listed as threatened or endangered.

No endangered Hawaiian Hoary Bats (*Lasiurus cinereus semotus*) were observed during the survey, but the species is known to occur on Maui in relatively low numbers. The Hawaiian Hoary Bat forages for flying insects in a wide variety of habitats including native

WAIHOLI HOMESTEAD COMMUNITY
FINAL ENVIRONMENTAL ASSESSMENT/FINDING OF NO SIGNIFICANT IMPACT

forests, agricultural lands, urban areas, and over bays and ponds. The bat could forage and even roost on or near the project site, and one individual was observed during a survey of the Kula Residential Lots in 1994.

Potential Impacts and Mitigation Measures

The proposed Waiohuli Homestead Community is not expected to adversely impact any bird species or any threatened or endangered species. As the site changes from ranch land to the Waiohuli Homestead Community, existing species may be displaced or decline in abundance. However, other species (such as Common Mynas) may become more common due to the fact that some species prefer more developed areas. Axis deer, which seek shelter in dense brush and trees during the day, are expected to decline in number if forested patches are cleared for residential development.

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5.0 ASSESSMENT OF THE EXISTING HUMAN ENVIRONMENT, POTENTIAL IMPACTS AND MITIGATION MEASURES

This chapter provides background information on the existing human environment. Subject areas addressed include archaeology, culture, air quality, noise, visual environment, population and housing, community character, and economic environment. This chapter also addresses the potential impacts of the project and identifies appropriate mitigation measures to minimize the identified short- and long-term impacts.

5.1 ARCHAEOLOGICAL AND HISTORIC RESOURCES

Early Hawaiian settlement from the AD 1200s is evident from the large number of archaeological sites in the Kula region, including recorded and unrecorded *heiau*, stone-walled enclosures, house platforms, and agricultural terraces. In 1989, Paul H. Rosendahl, Inc. (PRHI) (Brown *et al.* 1989) conducted an archaeological inventory of approximately 1,025 acres in Waiohuli and Kēōkea. The survey led to the identification of significant cultural resources, including *heiau*, intact dryland agricultural field systems, residential complexes, and human burials. One such site, Kaimupeeioa Heiau, is located within the central portion of the Waiohuli Homestead Community. In total, 159 archaeological sites consisting of 274 features were recorded during the survey.

The State DLNR Historic Preservation Division (SHPD) also conducted an extensive survey of the Waiohuli area for the DHHL in the early 1990s (Kolb *et al.* 1997). This survey led to the documentation of permanent habitation sites and agricultural areas running down ridges, often with a large *heiau* occurring at the end of the ridges. The survey also led to the identification of other types of permanent habitation sites, burials, and agricultural fields. The SHPD recommended that a total of 18 sites be preserved. These sites include the Papakea Heiau, the Molohai Heiau, burial sites, a large agricultural terrace, two permanent habitation sites, a religious or high-ranking residence, and a habitation site with an enclosed sinkhole and agricultural features. The SHPD also recommended data recovery for a number of sites for which preservation was deemed unnecessary. The SHPD highly recommended that data recovery be conducted prior to infrastructure installation and occupation of the lots.

An archaeological inventory survey was completed by Kolb *et al.* (1997). Appropriate mitigation measures and preservation efforts have been coordinated with the SHPD. This survey was accepted by the SHPD in 1997. In addition, a data recovery plan was completed by Scientific Consultant Services, Inc. (SCS) and accepted by the SHPD in August 2004. Data recovery fieldwork has been completed by SCS and the report is currently being prepared.

SCS, in conjunction with recommendations by the SHPD, also conducted a revised inventory survey to document archaeological sites occurring strictly within proposed road corridors of the Waiohuli Homestead Community site (Dega *et al.* 2005). This report is

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included in Appendix D. According to the inventory survey, nine roadways are planned to be constructed in the site. A total of 18 previously identified and recorded archaeological sites occur in these proposed road corridors. A total of 35 new features associated with nine previously recorded sites were identified and recorded during this most recent survey². All features investigated were associated with traditional times, and of the 18 sites located within road corridors, only one is recommended for further work (burial treatment). No further work is necessary at the other 17 sites. The SHPD approved the report on this work in June 2005.

The following describes the archaeological sites identified within proposed road corridors.

Road A is planned to run through the Waiohuli Homestead Community site and connect Waiohuli and Kēōkea. The road alignment has been developed to avoid as many archaeological site/features as possible. A majority of the other eight roadways will connect to Road A. The Road A corridor contains both previously recorded and unrecorded sites with features generally consisting of enclosure, C-shape, U-shape, walled terrace, wall mound, and alignment feature classes. All features in the Road A corridor have been recorded and no further work is needed.

Road E contains five sites with features in the general feature class of wall, enclosure, mound platform, rock shelter, and alignment. The majority of sites/features in this roadway were interpreted as small habitation loci and agricultural areas. Minimal cultural materials were recovered but showed a pattern related to traditional-period occupation of the landscape. No further work is needed at any of these sites.

Road F contains two sites with features in the general feature class of wall, lava tube, terrace, modified outcrop, C-shape, and platform. One burial was identified in Road F and will be addressed in a burial treatment plan currently being prepared.

Road G contains two sites with features in the general feature class of terrace and wall. No further work is needed at any of these sites.

Road H contains four previously recorded sites with wall, platform/terrace, and enclosure features. No further work is needed at any of these sites.

Road I contains two sites with terrace and enclosure features. No further work is needed at any of these sites.

Road J contains two sites with platform and enclosure features. No further work is needed at any of these sites.

² The archaeological inventory survey of the proposed road corridors included nine roadways planned to be developed within the site (Roads A, E, F, G, H, I, J, L, and M). Since the survey was conducted, the site plan has been revised to include 12 roadways (Roads A, E, F, G, G₁, G₂, H, J, K, L, L₁, and M). As such, the names of the roadways in this survey may not correspond to the names of roadways currently planned. However, all currently proposed road corridors have been surveyed under different road names. Road I is no longer planned to be developed and the currently proposed Road K was surveyed as part of Road L in the archaeological survey.

Road L contains three sites with enclosure, terrace, and rock shelter features. No further work is needed at any of these sites.

Road M contains no archaeological sites.

Potential Impacts and Mitigation Measures

Within the project area, the 18 archaeological sites recommended for preservation by the SHPD will be preserved. In addition to the accepted archaeological inventory survey projects conducted and the data recovery plan accepted by the SHPD, other plans to mitigate impacts to archaeological resources include a preservation plan to assess all sites to be preserved, a burial treatment plan for the five known burial sites, and a monitoring plan for all infrastructure work that could lead to the identification of significant cultural resources such as burials. Archaeological monitoring has been recommended by the SHPD during construction of the proposed road corridors to ensure that any identified remains will be appropriately documented and preserved. An archaeological monitoring plan will be prepared for SHPD to review prior to the initiation of road work in the project area.

As recommended by the State Office of Hawaiian Affairs (OHA) in its comment letter on the DEA (Chapter 10.0), all ground-altering activities will be monitored by a professional archaeologist and pre-contact historic properties will not be destroyed unless absolutely necessary to accommodate housing for DHHL beneficiaries. Despite efforts to design the proposed roadways to avoid disturbing any known burials, it appears necessary to move one burial a few meters away. The Maui/Lānaʻi Islands Burial Council, OHA, and community associations will be consulted before any actions are taken. Should burials or Native Hawaiian traditional deposits be identified while monitoring during ground-altering activities, all work in the area of the find will cease and the appropriate agencies will be contacted.

5.2 CULTURAL RESOURCES

As discussed in Section 5.1, there are many archaeological sites present in the project area. The historic and archaeological context of the Kēōkea/Waiohuli area and the surrounding region indicates a once active community that used the land for agricultural, residential, and religious purposes. Past cultural practices associated with the property relate to gathering, religious, and day-to-day activities. Over the past century, the property has been leased by the DHHL for cattle grazing and agricultural uses.

Many of the culturally significant sites, such as heiau and ahu (altars, shrines) no longer exist primarily due to the paniolo era in which cattle ranchers cleared much of the land. During the late 1950s and 1960s, there was an influx of western-built structures, homes, and population to Kula. This left little recovery of what had already been destroyed by the paniolo era.

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The project's cultural consultant, Charlie Maxwell, Sr. conducted several interviews with long-time residents of the area, including Mr. David "Haha" Kalahanohano Fernandez, Mr. James K. Kapohakimohewa, Mr. Fredrick Ventura, Mr. Kenneth Ventura, Mr. Wayne Lu, and Ms. Hokulani Holt-Padilla. Attempts were made to contact residents at least 80-years-old, but those interviewed did not remember much about the Kēōkea/Waiohuli area. The following are the consultant's summaries of these interviews.

Interview with Mr. David "Haha" Kalahanohano Fernandez on August 14, 2004:

He related that he was born in Kula Hospital on July 16, 1923. At that time his family resided right above this project in a cottage at Keokea School. That he remembers growing up in this area and on many occasions would play, ride horse through the area. He remembers being told by his elders that there were Heiau and other 'Hawaiian stuffs' in the area and don't be niele (inquisitive) and don't touch any of the plateforms or other sites in the area. He was told that at one time there was a very large settlement of Hawaiians that lived in the area and they were mostly farmers, their crops being sweet potatoes. They would build their Hale (house) with stone foundation and had a 'big village' like Keone-oio on the Makena cost below Kula. His family later moved to Waiakoa where he presently resides at. He could not think of anyone that had information about the archeological sites and believed that a lot of the sites has been destroyed by cattle raised on the project throughout these many years. Had nothing further to offer.

Interview with Mr. James K. Kapohakimohewa on August 19, 2004:

At his residence. He related that he was born in Kahakuloa Village on 3/18/36. In 1941 or thereabouts, his family moved to Kula and have lived in the general area of Waiohuli ever since. He remembers a youngster playing in the area of the project, but does not recall the specific archeological sites. That they area was always in cattle ranching and can remember his parents telling him that there are a lot of things in the pasture from the 'old Hawaiians' and he should not disturb anything. He had nothing further to add on the subject property.

Interview with Mr. Fredrick Ventura on August 19, 2004:

At his home, he mentioned that he was born in Waiakoa on April 3rd, 1938. That he remembers hiking in the area in his youth, but does not remember seeing any archeological sites and only remembers that there was cattle on the property. His brother Kenneth might have some information on the subject property. He had nothing further to add.

Interview with Mr. Kenneth Ventura on August 19, 2004:

At his residence, he related that on numerous occasions he either played or hiked on the property but being young did not particularly pay attention to the archeological sites in the area. His parents always told him not to touch anything Hawaiian in the pastures. Had nothing further to add.

Interview with Mr. Wayne Lu on August 22, 2004:

At his residence, he related that he was born on Oahu on May 7, 1941 and moved to Maui in 1964. He lived in the Kula area since then and can remember hunting on the property on numerous occasions. That he remembers house sites and other structures but does not know what it was for and only knew that it was built by the ancient Hawaiians that once

lived throughout the area. Had nothing further to add.

Interview with Ms. Hokulani Holt-Padilla on July 15, 2004:

By telephone, stated that she was born on Oahu and moved to Maui at a young age and was raised in Waiehu by her Grandparents. That she is aware of the numerous archeological sites on the subject property from research but does not have any information on it. She strongly feels that the sites should be preserved more so because it is on Hawaiian Homes Land property for the future Hawaiian generation yet to come. Had nothing further to add.

A cultural impact assessment was also prepared for the *Kēōkea Agricultural Lots – Unit 1 Final Environmental Assessment* (SSFM 2001). The Kēōkea Agricultural Lots are located directly south of the Waiohuli Homestead Community site. The cultural impact assessment concluded that given the recent historical use for ranching and agriculture, Native Hawaiian cultural practices are no longer conducted on the property (Munekiyo & Hiraga 2001). The assessment further concluded that the conversion of land to agricultural and residential use (replacing more recent cattle grazing and other agricultural use) is consistent with the area's past use for similar purposes.

Potential Impacts and Mitigation Measures

Cultural impact assessments of the project area have concluded that many culturally significant sites have been destroyed by ranching activities in the past. An appropriate land use pattern for the Waiohuli Homestead Community site would recognize the cultural practices and beliefs that once took place on the land. Additionally, approximately 100 acres of the 523-acre site will remain undeveloped to preserve cultural and archaeological sites (Figure 3).

5.3 NOISE

Due to the rural nature of the project area, there are no major sources of noise. Ambient noise levels in the area are attributed to wind, wildlife, traffic along Kula Highway (adjacent to and east of the Waiohuli Homestead Community site), and agricultural equipment such as tractors, sprayers, and trucks.

Potential Impacts and Mitigation Measures

During project construction, noise will be generated by construction and earth-moving equipment. However, these short-term noise impacts will occur only during working (daytime) hours and will primarily affect only those margins of the property that border sensitive land uses (i.e., residential use at the Kula Residential Lots, Unit 1, north of the property). The project will comply with State DOH noise regulations, and if construction noise is expected to exceed the DOH "maximum permissible" property line noise levels, a permit will be obtained from the DOH (to allow the operation of vehicles, construction equipment, power tools, etc). After construction, long-term noise impacts could result from vehicular traffic associated with the project. These impacts, however, are not

expected to be significant or more intense than noise impacts that would result from traffic generated by other residential uses in the area. Project activities will comply with Chapter 11-46, HAR, regarding Community Noise Control.

5.4 AIR QUALITY

Since there are no point sources of airborne emissions, and northwesterly tradewinds are almost always present, air quality at the Waiohuli Homestead Community site and surrounding area is very good. Most of the existing airborne pollutants are attributed primarily to vehicle-generated exhaust from the region's roadways. Other sources of airborne pollutants include fugitive dust and equipment emissions generated by agricultural machinery and activities. However, these sources are considered intermittent and the generated particulates are quickly dispersed by the prevailing tradewinds.

Potential Impacts and Mitigation Measures

Development of the proposed project may produce short- and long-term air quality impacts. Short-term impacts could include fugitive dust and exhaust emissions produced by construction equipment and vehicles. Long-term impacts could result from increased activity and development of the property. These impacts include increased vehicular exhaust and indirect emissions resulting from increased electrical power demand.

The substrate underlying the project site is comprised primarily of volcanic ash, which does not retain water for long periods, making it more susceptible to become airborne when disturbed. The physical characteristics of the substrate in conjunction with the almost constant northwesterly tradewinds create conditions which could potentially result in intensified dispersal of fugitive dust. Therefore, stringent dust control measures would be practiced to mitigate potential negative impacts to air quality.

Based on these anticipated impacts, the following mitigation measures may be implemented.

Short-term Mitigation

- Frequent watering during construction activities to maintain dust control in active work areas at least twice daily on days without rainfall.
- Initiation of a construction phasing plan that considers wind patterns and existing and future residential land uses to minimize downwind dust impacts within the project site and surrounding residential areas.
- Landscaping as soon as practicable, once grading has been completed.
- Wind screening as appropriate to limit fugitive dust.
- Application of mulch and soil stabilizers on graded areas.
- Covering trucks traveling on roadways and on-site washing to keep dirt from traveled roadways.
- Monitoring dust at the project boundary during the construction period.

Long-term Mitigation

- Encouraging and maintaining landscaping to maintain good air quality.

All construction activities will comply with State of Hawai'i Air Pollution Control regulations and the provisions of Section 11-60.1-33, HAR, on Fugitive Dust. A combination of mitigation measures will be implemented to minimize air quality impacts. During construction, these measures can be adjusted to reflect current site conditions. Impacts from exhaust emissions of construction vehicles will primarily be mitigated by winds; however, particular care will be taken when construction activities occur near existing homes or highways. A dust control management plan will be developed to identify and address all activities that may generate fugitive dust. The plan will also identify mitigation measures to minimize the potential impact on air quality.

5.5 VISUAL RESOURCES AND OPEN SPACE

The Waiohuli Homestead Community site is located on the westerly slopes of Haleakalā. The Upcountry region has extensive open space and rolling green hills with scenic vistas of the Haleakalā summit, Central Maui isthmus, offshore islands, and the West Maui Mountains. Within the project site, there are several clearings that provide views of the northern and southern shorelines of the island.

Potential Impacts and Mitigation Measures

The visual appearance of a portion of the proposed project site will change from cattle grazing land to a residential community. Since only 196 acres of the approximately 523-acre site will be developed, open space and visual resources will be preserved. Existing views of the Central Maui plain and coastline from higher elevations within the project site will be maintained.

5.6 POPULATION

Maui is the fastest growing County in the State of Hawai'i. The 2000 U.S. Census reported that the resident population of Maui County increased 21.6 percent from 100,504 in 1990 to 128,241 in 2000. Growth in Maui County is expected to continue, with resident population projections for the year 2010 and 2020 estimated at 151,269 and 175,136, respectively (SMS 2002).

The Makawao-Pukalani-Kula region has also experienced population growth. In 2000, the population of the region was 21,571. Projections for the region's year 2010 and 2020 populations are estimated at 25,237 and 28,974, respectively (SMS 2002). According to the County of Maui Department of Parks and Recreation (DPR), the existing population of the Kula area is approximately 7,200 (Chapter 10.0).

Potential Impacts and Mitigation Measures

Assuming three to four persons per household and a total of 337 new households once the proposed Waiohuli Homestead Community is completed and occupied, the development may contribute between 1,011 and 1,348 residents to the region's population. However, some future residents of the Waiohuli Homestead Community may already live in the Makawao-Pukalani-Kula region, and therefore, the actual number of new residents to the region may be lower. The increase in resident population is not anticipated to have a significant adverse impact on the County's resident population or the rural character of the Upcountry area. The majority of the project site will remain undeveloped, and the proposed residential use is not expected to impact agricultural activities at the planned Kēōkea Agricultural Lots or other agricultural uses in the project area.

The Waiohuli Homestead Community will provide native Hawaiians with much needed affordable single-family residences (versus competing against all Maui residents in the open market). The beneficiaries of the individual lots are likely to be existing Maui residents, State of Hawai'i residents, and possibly some out-of-State native Hawaiians.

5.7 HOUSING

The *Maui Island Plan* beneficiary survey indicated that the largest percentage of the beneficiaries (39.2 percent) preferred the Upcountry region for a residential homestead. Approximately 1,107 units are needed in Upcountry to meet surveyed beneficiary demand. Of the Upcountry lands that are in the DHHL inventory, Kēōkea/Waiohuli presents the best opportunity to develop residential homesteads and meet beneficiary demand.

Potential Impacts and Mitigation Measures

Within the 523-acre site, approximately 196 acres of land would be designated for single-family residential use for native Hawaiians. The project will help to meet the high demand for homes in Maui and will provide home ownership opportunities for native Hawaiians, especially with escalating housing prices. The Waiohuli Homestead Community will also help the DHHL to fulfill its mandate to develop and deliver homesteads to native Hawaiians by creating a livable neighborhood.

In accordance with the HHCA, 1920, as amended, Hawaiian home lands are not subject to zoning or other land use controls by the State or County.

5.8 LIFESTYLE/CHARACTER OF THE COMMUNITY

The Upcountry region has extensive open space and rolling green hills with the summit of Haleakalā rising above the region to the east. Strong *paniolo* and farming traditions are evident and have affected architecture, patterns of development, and a uniquely

Upcountry lifestyle. These are close-knit communities with values placed on open space and rural characteristics.

Major population centers in the Makawao-Pukalani-Kula region include the towns of Makawao and Pukalani. Both of these towns are characterized by a mixture of small-town urban and outlying rural land uses. Although Makawao has grown as a tourist destination, it retains its *paniolo* character.

Potential Impacts and Mitigation Measures

The proposed Waiohuli Homestead Community is not expected to have a significant adverse impact on the character of the Makawao-Pukalani-Kula region. The *Makawao-Pukalani-Kula Community Plan* states, “land use patterns should be evaluated not only in terms of existing communities, but in terms of developing new residential communities (i.e., Hawaiian Homes) which are consistent with and which complement the existing Upcountry atmosphere.” The Waiohuli Homestead Community is supported by the *Makawao-Pukalani-Kula Community Plan* and will blend with the lifestyle and character of the region. The proposed project will result in positive social impacts, including the enhancement of residents’ quality of life through the provision of residential homes for native Hawaiians.

5.9 ECONOMIC CHARACTERISTICS

The Waiohuli Homestead Community site is currently used for cattle grazing under a revocable permit granted by the DHHL. This activity generates some revenue and little demand for public facilities and services that require government revenue.

Potential Impacts and Mitigation Measures

The proposed Waiohuli Homestead Community will generate direct, indirect, and induced construction-related jobs, both within the site and island-wide and Statewide. Construction industries, as well as industries supporting construction, will benefit from the employment and economic opportunities provided by the proposed development. Various nearby businesses in the Upcountry area would achieve significant economic gains, as construction workers and residents of the proposed development are expected to patronize them.

Numerous individuals and businesses will benefit from increased personal income and expenditures made possible by construction of the Waiohuli Homestead Community. The State will also benefit from the proposed project through the generation of income tax and general excise tax revenues.

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6.0 ASSESSMENT OF THE EXISTING INFRASTRUCTURE AND PUBLIC SERVICES, AND POTENTIAL IMPACTS AND MITIGATION MEASURES

This chapter discusses the existing infrastructure of the project area and the proposed infrastructure improvements. Mitigation measures have also been identified to address potential impacts.

6.1 TRANSPORTATION FACILITIES

Vehicular Transportation. A Traffic Impact Analysis Report (TIAR) was prepared for the project by Phillip Rowell and Associates in May 2005. The purpose of the TIAR was to determine and describe the traffic characteristics of the project area, quantify and document traffic-related impacts of the project, and identify and evaluate traffic-related improvements required to provide adequate access to and egress from the project area and to mitigate the project's traffic impacts. This report is included in Appendix E.

The TIAR studied the following intersections:

1. Haleakalā Highway at Kula Highway/Old Haleakalā Highway
2. Haleakalā Highway at Makawao Avenue
3. Haleakalā Highway at Makani Road
4. Haleakalā Highway at Old Haleakalā Highway
5. Haleakalā Highway at Hāna Highway
6. Old Haleakalā Highway at Makawao Avenue and Loha Street
7. Old Haleakalā Highway at Pukalani Street
8. Old Haleakalā Highway at Makani Road
9. Kula Highway at King Kekaulike High School Entrance
10. Kula Highway at Kamehameha School Entrance and Kulamalu
11. Kula Highway at Thompson Road
12. Kula Highway at Lau'ie Drive
13. Kula Highway at Road B

As noted by the DPWEM (Chapter 10.0), existing streets providing access to the project shall have a 20-foot minimum pavement width. Existing traffic characteristics of roadways serving the project are summarized in Table 2 below.

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Table 2. Existing Traffic Characteristics of Roadways Serving the Project

Roadway	Section	Jurisdiction	Lanes	Divided	Approximate ADT	Posted Speed Limit
Hana Highway	South of Haleakala Highway	State	2	Yes	29,100	55
	North of Haleakala Highway	State	4	No	5,700	55
Haleakala Highway	Hana Highway to Old Haleakala Highway	State	3	No	26,000	55
	Old Haleakala Highway to Makani Road	State	4	Yes	14,400	45
	Makawao Road to Makawao Avenue	State	4	Yes	10,000	45
	Makawao Avenue to Kula Highway	State	3	Yes	10,700	45
Kula Highway	East of Haleakala Highway	State	2	No	14,400	45
Old Haleakala Highway	Haleakala Highway to Makani Road	County	2	No	13,000	35
	Makani Road to Makawao Avenue	County	2	No	12,000	35
	Makawao Avenue to Kula Highway	County	2	No	4,300	35
Pukalani Street	South of Old Haleakala Highway	County	4	No	16,800	20
Makani Road	Haleakala Highway to Old Haleakala Highway	County	2	No	2,000	30
Makawao Avenue	Old Haleakala Highway to Haleakala Highway	County	2	No	6,700	30

Source: Phillip Rowell and Associates, May 2005

Non-vehicular Transportation. The Waiohuli Homestead Community site is within the Kula-‘Ulupalakua study area of the *Upcountry Greenway Masterplan* (Draft) (Chris Hart & Partners and Munekiyo & Hiraga, Inc. 2004). The goal of the plan is: *An integrated system of non-motorized transportation and recreation multi-use routes, trails and paths, which respect the rights of private property owners and utility service companies, and which are compatible with existing and future land uses in the region.* The objectives of the plan include:

- a. Identify greenway routes which provide linkages between and within communities.
- b. Establish greenway design criteria which are suitable for multi-use and multi-function purposes.
- c. Develop routing criteria which recognizes physical, operational and land use needs of private property owners and utility service providers.
- d. Establish a regulatory and management framework to ensure the long-term operational success of the Upcountry Greenway.
- e. Develop a user education program to promote user safety and welfare and to broaden understanding of private property interests and needs.

- f. Develop greenway implementation priorities and timeframes which maximize operational utility within the context of available funding.

Either a “Near-Term Off-Road Route” or a “Near-Term Route Within or Adjacent to Right-of-way” will pass the project site along Kula Highway. No priority routes have been selected for this region.

Potential Impacts and Mitigation Measures

Proposed Roadways. Primary access and egress will be via Lau‘ie Drive, which is an existing roadway through the Kula Residential Lots. The intersection of Lau‘ie Drive and Kula Highway is an unsignalized intersection with no separate left turn lanes into or out of the project area. Secondary access and egress will be via a new roadway (Road B) through the Kēōkea Agricultural Lots.

Twelve paved roadways (Roads A, E, F, G, G₁, G₂, H, J, K, L, L₁, and M), 40 to 50 feet in width, will be constructed within the site. The roadways will accommodate the Maui County Department of Fire Control’s equipment, and a 30-foot radius will be provided at the intersection of the proposed subdivision roads and the adjoining subdivision roads and State roads. Pursuant to Section 220 of the HHCA, the roadways within the Waiohuli Homestead Community will be owned by the DHHL with a license issued to the County for maintenance purposes.

Vehicular Traffic Impacts. The TIAR estimated background traffic conditions (future traffic volumes without the proposed project) for the design year 2010. The *Maui Long Range Transportation Plan* concluded that traffic in Maui would increase an average of 1.6 percent per year from 1990 to 2020. This growth rate was used to estimate the background growth between 2004 and 2010, which is the design year for this project. The second component in estimating background traffic volumes is traffic resulting from other proposed projects in the vicinity. Related projects are defined as those projects that are under construction, have been approved for construction, or have been the subject of a traffic study and would significantly impact traffic in the study area. Related projects may be development projects or roadway improvements.

It was determined that there are three projects in the Pukalani area that will generate additional traffic within the study area.

The first is the proposed Upcountry Town Center, which will be in the triangle bordered by Old Haleakalā Highway, Makawao Avenue, and Haleakalā Highway. The traffic study for this project was obtained and reviewed. The traffic study for the Upcountry Town Center recommended the following roadway improvements at the study intersections:

1. Exclusive right-turn lanes from Haleakalā Highway at Makawao Avenue;
2. Exclusive right-turn lane along the southbound approach of Makawao Avenue at Haleakalā Highway; and
3. Exclusive left-turn signal phase for Makawao Avenue movements at Haleakalā Highway.

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The traffic study analyzed three intersections adjacent to the Upcountry Town Center (Haleakalā Highway at Makawao Avenue, Old Haleakalā Highway at Makawao Avenue, and Old Haleakalā Highway at Kula Highway). The traffic generated by the Upcountry Town Center was assigned to the other intersections within the study area and added to the background traffic previously estimated. However, according to the Maui County Police Department, Maui Land & Pineapple, Inc. (ML&P) has cancelled the Upcountry Town Center project, and in the meantime, the anticipated traffic on Makawao Avenue at the Old Haleakalā Highway and Haleakalā Highway By-pass intersections should be lessened (Chapter 10.0). ML&P will likely develop this property in the future and, at that time, will be required to identify project-related traffic impacts and propose mitigation measures to minimize traffic in the area.

The second project is the expansion of Kamehameha School and includes Kulamalu and other development associated with the Kulamalu Development. The traffic study for this project was also obtained and the traffic assignments used to develop the traffic forecasts. It should be noted that the traffic assignments include traffic generated by grades 7 through 12, some of which have been added since the traffic study was completed. Therefore, the traffic for the grades added since has been double counted as it is included in the existing counts and forecasts. The installation of traffic signals at the intersection of Kula Highway and the Kamehameha School Entrance is associated with this project.

The third project is the Kauhale Lani Subdivision, which proposes 165 single-family residences. However, this property was recently sold and it is unknown if the project will be significantly revised.

The TIAR provided a trip generation summary (reproduced below in Table 3) for these projects.

Table 3. Trip Generation Summary of Related Projects

Related Project	AM Peak Hour			PM Peak Hour		
	Total	In	Out	Total	In	Out
Upcountry Town Center ¹	486	320	163	1,017	444	573
Kamehameha School (additional grades) and Kulamalu ²	852	524	328	736	378	358
Kauhale Lani ³	137	32	95	168	108	60
TOTAL	1,338	844	491	1,753	822	931
Notes:						
1 Parsons Brinckerhoff Quade & Douglas, <i>Traffic Impact Assessment Study Upcountry Town Center</i> , March 2002						
2 Phillip Rowell and Associates, <i>Traffic Impact Study for Kamehameha School, Maui Campus</i> , August 15, 2002						
3 Phillip Rowell and Associates, <i>Traffic Impact Analysis Report for the Kauhale Lani Community</i> , May 2005						

In its comment letter on the DEA, the County of Maui Planning Department noted two other projects in the Pukalani area that should be included in the background traffic conditions (Chapter 10.0). The Hanohano Subdivision is a proposed 49-lot single-family subdivision, and the Makaena Place Subdivision is a proposed redistricting for a potential 39-lot single-family subdivision. Combined, these subdivisions include 88 single-family lots and are likely to generate about half as many trips as the Kauhale Lani project (which

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proposes about twice as many single-family homes) during the AM and PM peak hours. Since plans for the Upcountry Town Center (which would have generated a significantly greater number of trips than the Hanohano Subdivision and Makaena Place Subdivision) have been cancelled and it is unknown if the Kauhale Lani project will be significantly revised, the TIAR overestimated future traffic in the study area. The TIAR also overestimated future traffic by conservatively assuming that once the subdivision improvements for the Waiohuli Homestead Community were completed, awardees of the various lots would immediately build and occupy their respective lots – historically, this has not been the case.

In the Kula and Waiohuli areas, the following projects were identified:

1. Kula Residence Lots, Units 1 Subdivision, 219 remaining lots;
2. Hawaiian Home Lands Subdivisions at Waiohuli; and
3. Kēōkea Agricultural Lots.

Forecasts associated with these three projects were obtained directly from the traffic study for the Hawaiian Home Lands Subdivision at Waiohuli.

During review of the traffic study for the Kamehameha Schools, it was learned that State of Hawai'i Department of Transportation plans to signalize the intersection of Haleakalā Highway at Makani Road. A scheduled completion date was not provided, but it was assumed that construction would be completed within the design year of the project (2010).

Future traffic volumes generated by the project were estimated using the procedures described in the *Trip Generation Handbook* and data provided in *Trip Generation*. This method used trip generation rates to estimate the number of trips the project will generate during the peak hours of the project and along the adjacent street.

The project will consist of 337 single-family residential lots and will generate 63 inbound and 190 outbound trips during the morning peak hour. During the afternoon peak hour, the project will generate 214 inbound and 126 outbound trips.

Based on the estimated background traffic conditions, the TIAR also performed a level-of-service (LOS) analysis for future traffic conditions without and with the traffic generated by the project. There are six levels-of-service, A through F, which relate to the driving conditions from best to worst.

Overall, increases in peak hourly traffic volumes resulting from project-generated traffic are significantly less than the increases resulting from ambient background traffic growth and traffic generated by other projects. The TIAR concluded that there are no significant changes in the LOS of any of the intersections studied as a result of traffic generated by the project. The background LOS of several intersections will be below acceptable conditions, whether or not the proposed Waiohuli Homestead Community is constructed to full build-out, because of heavy background traffic volumes. These intersections include:

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1. Haleakalā Highway at Kula Highway;
2. Haleakalā Highway at Makawao Avenue;
3. Haleakalā Highway at Hāna Highway; and
4. Kula Highway at King Kekaulike High School.

The low LOS at these intersections is a result of regional traffic. Traffic generated by the project comprises a small percentage (1.28 percent or less) of the total traffic projected to use these intersections during peak hours. This is a clear indication that the low LOS at these intersections is a regional issue that must be addressed on a regional basis. The TIAR recommended that improvements identified in the *Maui Long-Range Land Transportation Plan* be implemented and stated that the DHHL should be responsible for no more than the project's pro rata share of the total traffic using these intersections.

The TIAR also analyzed the LOS at intersections along Kula Highway serving the project. These intersections will operate at high LOS (C or better) without additional lanes or improvement, except for the northbound approach of Lau'ie Drive at Kula Highway. The TIAR suggested improving this intersection by providing a separate left-turn lane from Kula Highway into the project area and a refuge lane for traffic turning left from the project area to Kula Highway. With these improvements, the intersection will operate at a LOS C at project build-out. Since this improvement may not be necessary until the project is in the later stages of build-out or at full build-out, this intersection should be monitored, possibly by the Maui Police Department, to determine when the improvements should be implemented, based on the Police Department's professional experience.

According to the Maui Police Department, traffic onto Kula Highway may not be affected significantly in the project area at this time with the development of the Waiohuli Homestead Community. The 342-acre Kēōkea Agricultural Lots will include 69 agricultural lots, averaging between 2.0 and 2.5 acres. The population density, and thus traffic impacts, will be lower than that of residential lots. The FEA for the Kēōkea Agricultural Lots (SSFM 2001) concluded that "the proposed project will not have any significant adverse impacts on circulation and traffic in the area".

The Maui Police Department also noted that with additional students residing in the Waiohuli Homestead Community and attending public schools in the area, traffic near these schools will affect the AM and PM peak traffic flows and the overall traffic level of service at the intersection of Haleakalā Highway and Kula Highway (Chapter 10.0). This impact was addressed in the TIAR included in Appendix E.

The TIAR also noted that there may be horizontal and vertical alignment constraints that adversely impact sight distances at the unsignalized intersections along Kula Highway in Waiohuli and Kēōkea. The TIAR recommended that the project's civil engineer verify that adequate sight distances are provided. After reviewing the DEA, the Maui Police Department stated:

Kula Highway in the area of the Kula Residential Lots should be planned to accommodate road widening projects in the future, as it appears at this time to have sufficient sight-

distance for vehicle safety. However, shoulder improvements would need to be made for roadway widening. (Chapter 10.0)

None of the proposed residential lots will abut Kula Highway; therefore, there will be adequate space to allow future widening of this roadway. As recommended by the DPWEM, a site plan and a sight distance report to determine required sight distance and available sight distance at existing and proposed street intersections shall be provided for review and approval (Chapter 10.0).

Non-vehicular Traffic Impacts. The proposed Waiohuli Homestead Community does not conflict with the goal or objectives of the *Upcountry Greenway Masterplan*.

6.2 WATER SUPPLY FACILITIES

Existing Facilities. The County of Maui Department of Water Supply (DWS) provides water service to the Makawao-Pukalani-Kula region. According to the DWS, the project site is served by the Upcountry/Makawao system, which is supplied by the Makawao Aquifer (with a sustainable yield of 7 million gallons per day) and streams of the Ko'olau system (Chapter 10.0). There is an 8-inch waterline in proximity to the project site along Laue Drive. Storage is provided by the 2-MG Kula Kai Tank.

Water Credits Agreement. On December 8, 1997, the DHHL and the DWS executed a Memorandum of Understanding (MOU) to construct water system improvements to provide potable water for residential development at the DHHL Kēōkea/Waiohuli tract. The DHHL constructed a new 18-inch water transmission main from Nā'alaē Road to Waiohuli, two new booster pumps in the vicinity of the existing Kula Kai water tank, and three new reservoirs, two new pumps, and distribution lines in the Kula Residential Lots, while the DWS constructed a new in-line booster pump station and a new 2.0-MG water storage tank on the Lower Kula transmission main. Additionally, a Water Credits Agreement (WCA) between the DHHL and the DWS was signed on December 9, 1997. Under the terms of the WCA, the DWS will maintain the water system improvements and provide the DHHL with up to 500,000 gallons of potable water per average day (gpd), except during any drought affecting the Lower Kula area as declared by the DWS.

Potential Impacts and Mitigation Measures

The number of lots that can be developed for the Waiohuli Homestead Community is limited by the amount of water available under the WCA. The existing 321-unit Kula Residential – Unit 1, the planned 99-unit Kula Residential – Unit 2 in-fill development, and the proposed 69-unit Kēōkea Agricultural Lots will use 293,400 gpd from the 500,000 gpd WCA; 206,600 gpd would be available. However, 4,250 gpd of the available allotment has been allocated to a proposed 2.5-acre park within the Kula Residential subdivision. Therefore, only 202,350 gpd would be available for development covered by this EA. Using the DWS standard of 600 gallons per unit, there is sufficient capacity under the WCA to service an additional 337 units. According to the DWS, the anticipated

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consumption for the proposed project would be approximately 202,200 gpd by system standards (Chapter 10.0). The project is located in an area of inadequate water supply; however, the DHHL has met its source requirement.

The water service elevation, the point where the County water line enters the Kēōkea/Waiohuli tract, is a determining factor in the location of the additional 337 units. The water service elevation is at the 2,750-foot elevation (bottom of reservoir), where a 500,000-gallon reservoir is located. The service zone of the 2,750-foot reservoir is between elevations 2,668 and 2,478 feet. Approximately 150 units will be serviced within this service zone.

The remaining 187 units are below the 2,750-foot reservoir service zone. A new 250,000 gallon reservoir is planned at the 2,560-foot elevation (bottom of reservoir) within the Waiohuli Homestead Community. This reservoir will provide pressure relief serving lots between the elevation range of 2,478 and 2,293 feet. Necessary infrastructure improvements to service the Waiohuli Homestead Community include transmission and distribution mains.

Regarding the County Planning Department's comments on the DEA, the DHHL has asked the DWS to monitor the usage of water against the 500,000-gpd allotment for the developments, rather than the 600 gpd for each lot. Some homes may use more than 600 gpd, while other will use less. The DHHL has further requested that, in the event that the committed amount of 500,000 gpd is exceeded by the developments as a whole, the DWS will notify the DHHL and identify any homes that consistently use more than the average of 600 gpd. The DHHL would then send a letter to those homes, reminding the lessees that water should be conserved and that each home should not be using more than an average of 600 gpd.

In response to the DWS' comments on the DEA, the project will be subject to the subdivision rules and regulations of the DWS, and the DHHL and its lessees will be required to meet that standards for domestic, irrigation, and fire flow calculations. The fire flow requirement for single-family units is 1,000 gallons per minute at 350-foot spacing for a 2-hour period. Twelve-inch and eight-inch distribution waterlines are proposed to meet the fire flow criteria.

The following conservation measures were recommended by the DWS and will be considered:

- Eliminate Single-pass Cooling;
- Utilize Low-flow Fixtures and Devices;
- Maintain Fixtures to Prevent Leaks;
- Use Climate-adapted Plants; and
- Prevent Over-watering by Automated Systems.

Non-potable water is currently not available.

6.3 WASTEWATER FACILITIES

The Makawao-Pukalani-Kula region is not currently serviced by a County wastewater treatment system. For developments of 50 or more residential lots, the State DOH requires a wastewater treatment facility to service the subdivision; however, a variance (Docket No. 04-VWW-02) was granted by the DOH on August 26, 2004 to allow the use of individual waste disposal systems. According to the DOH Wastewater Branch (Chapter 10.0), the project site is located in the Non-Critical Wastewater Disposal Area as determined by the Maui County Wastewater Advisory Committee.

In response to the Maui County Planning Department's comments (Chapter 10.0), the DHHL is not aware of any potable drinking water wells in the vicinity of the project area.

Potential Impacts and Mitigation Measures

Individual waste disposal systems for the proposed Waiohuli Homestead Community are allowed by the DOH under the approved variance request. Conditions under which the variance was granted will mitigate potential impacts. These conditions include the following:

1. Cesspools shall not be used as on-site individual wastewater systems.
2. Lessees shall submit plans for each individual wastewater system to the DOH Wastewater Branch for review and approval. The systems shall be approved in writing by the DOH before it can be placed into service.
3. All individual wastewater systems shall be inspected at least once every two years or as specified by the individual wastewater system design engineer and pumped when necessary.
4. Low-flow plumbing fixtures shall be required in all new dwellings.
5. The development shall connect to a municipal sewer system, should it become available to the area.

After reviewing the DEA, the DOH Wastewater Branch stated that it had no objections to the proposed project, provided that wastewater treatment and disposal follows the conditions listed in the Decision and Order for Docket No. 04-VWW-02, granted on August 26, 2004 (Chapter 10.0). In addition, the DOH stated that all wastewater plans must conform to applicable provisions of Chapter 11-62, HAR, Wastewater Systems, and the DOH reserves the right to review detailed wastewater plans for conformance to applicable rules.

6.4 DRAINAGE FACILITIES

The Upcountry region can be characterized as having broad, rolling ridge tops, deep precipitous gulches, and slopes increase along ridges as the terrain ascends in elevation. There are many gulches that separate the region's arable lands into smaller areas.

The Waiohuli Homestead Community site consists of approximately 523 acres of land

used for cattle grazing, and the natural slope and well-draining soils on the site provide adequate drainage for current conditions. When rainfall is heavy enough to produce overland flow, water sheet flows and enters Waiohuli Gulch, which flows through the northern portion of the site. Runoff from Waiohuli Gulch is discharged into Waipu'ilani Gulch and ultimately the ocean. The entire site and surrounding area is designated Zone C (areas of minimal flooding) by the Flood Insurance Rate Map (Figure 6).

Drainage facilities within the Kula Residential Lots (adjacent to and north of the project site) include paved swales, drain inlets, manholes, and drainage culverts along roadways; lined interceptor ditches along property lines; and outlet structures along gulches. Runoff generated from off-site drainage areas mauka of the project site are assumed to pass through or over Kula Highway onto the property.

Potential Impacts and Mitigation Measures

A drainage master plan for this project and the planned Kēōkea Agricultural Lots was prepared and is included in Appendix B (Community Planning and Engineering, Inc. 2005). According to this report, the Waiohuli Homestead Community site is small relative to the overall drainage basin area to which it contributes. The proposed drainage system will include culverts, catch basins, drain lines, drain manholes, and roadway swales. Culverts will be placed where the proposed roadways may obstruct any existing drainageways. Surface runoff flowing onto the proposed roadways will be channelized to a catch basin or culvert crossing location by roadway swales. Catch basins will be spaced to prevent the runoff within a swale from overflowing onto the paved roadway.

In response to comments from the Maui County Department of Public Works and Environmental Management (DPWEM), drainage facilities within roadways shall be licensed to the County for maintenance purposes (Chapter 10.0). A registered civil engineer will verify that the grading and runoff water generated by the project will not have an adverse impact on the adjacent and downstream properties. The preliminary drainage report will be revised to more clearly address impacts to adjoining and downstream areas and indicate how these impacts will be mitigated. The final drainage report and best management practices (BMP) plan will be submitted with grading plans to the DPWEM for review and approval prior to the issuance of grading permits. The report will include hydrologic and hydraulic calculations and the schemes for disposal of runoff waters, and will comply with the provisions of the "Rules and Design of Storm Drainage Facilities in the County of Maui". The BMP plan will show the location and details of structural and non-structural measures to control erosion and sedimentation to the maximum extent practicable.

The proposed project will alter some currently vegetated portions of the site with impervious surfaces (i.e., roadways and roofs) and may increase the potential for flood. However, drainage improvements (similar to those within the Kula Residential Lots) would be constructed to minimize the potential for flooding. Construction of such improvements will achieve proper drainage and flow of on-site storm water runoff.

During the construction phase of the project, potential short-term impacts from erosion could occur as a result of on-site storm water drainage patterns. Drainage control features would be established to minimize potential impacts resulting from construction-related activities. Best management practices would be considered for inclusion into project design plans. Additionally, appropriate coordination would be conducted with pertinent agencies during the normal construction plan review process to address applicable regulations and other requirements to address concerns during the project's design.

6.5 SOLID WASTE DISPOSAL FACILITIES

The County of Maui provides weekly garbage pick-up for a fee. The Central Maui Landfill, located in the Wailuku-Kahului Community Plan area, receives residential solid waste. According to the *Public Facilities Assessment Update* (R.M. Towill Corporation 2002), the Central Maui Landfill will have adequate capacity to accommodate commercial and residential waste through the year 2020, with a surplus capacity of approximately one million cubic yards of landfill space.

Green waste is collected by Eko Compost, which is located at the Central Maui Landfill. Construction and demolition waste is accepted at the privately operated construction and demolition landfill in Mā'alaea.

Potential Impacts and Mitigation Measures

As the population of Maui grows, demand on the Central Maui Landfill will increase irrespective of where new development occurs. The proposed Waiohuli Homestead Community will generate solid waste during the construction of backbone infrastructure and as the project achieves build-out. The quantity of solid waste generated will vary with different construction activities, and some wastes may require separate and special disposal methods. However, construction is not expected to have an adverse impact on the construction and demolition landfill in Mā'alaea. In addition, project construction will conform to the DOH program goals and objectives of the Integrated Solid Waste Management Act, Chapter 342G, HRS.

Once the site is fully developed, the projected solid waste generated by the residential development is estimated to average approximately 2.31 tons per day.

Single-family Residential: 4 persons x 337 units = 1,348 persons
3.37 pounds per person per day x 1,348 persons = 4,543 pounds per day or 2.27 tons per day

As of August 2002, approximately 46 percent of applicants for Hawaiian home lands on Maui currently reside on Maui. Although the proposed Waiohuli Homestead Community will likely introduce new residents to Maui, the Central Maui Landfill has adequate capacity to accommodate commercial and residential waste through the year 2020.

As requested by the DPWEM (Chapter 10.0), a solid waste/recycling plan will be

developed and submitted for review and approval.

6.6 ELECTRICAL AND COMMUNICATIONS FACILITIES

Electrical Facilities. The proposed project site currently has no electrical service. Electrical power on Maui is provided by Maui Electric Company, Ltd. (MECO). The Net Normal Top Load of MECO's peak demand is 225.57 megawatts (MW). This capacity is divided between the Mā'alaea Power Plant with 193.24 MW and the Kahului Power Plant with 32.33 MW. Additional electrical power from the Hawaiian Commercial & Sugar Company (HC&S) supplements the total capacity for MECO. Although HC&S (Pu'unēnē Mill) generates approximately 44 MW of electrical power, only 12 MW are supplied to MECO per a power purchase agreement under normal conditions.

The transmission grid on Maui primarily consists of seven 69-kilo-volt (kV) lines from the Mā'alaea Power Plant and four 23-kV lines from the Kahului Power Plant. A 69-kV line from the Mā'alaea Power Plant services Kihei/Wailea and continues upcountry to Kula and Pukalani. Power lines from the Kahului Power Plant service the Wailuku/Kahului area, the Ha'ikū/Makawao area, and East Maui. At the Pukalani substation, the 69-kV Kīhei/Wailea/Kula line links with the 23-kV Ha'ikū/Makawao line. The DHHL Kēōkea and Waiohuli Subdivision is currently served by a 12.47-kV line from the Kula Substation.

Communications Facilities. Telephone and communication service is not currently provided at the project site. Sandwich Isles Communications, Inc. (SIC) currently provides telephone service to DHHL properties and will be the service provider for the Waiohuli Homestead Community. SIC maintains a telephone office building on Kula Highway, near the project site. The Waiohuli Homestead Community is within the Oceanic Time Warner Cable service area.

Potential Impacts and Mitigation Measures

Electrical and communications improvements necessary to support the development can be served by utility companies, with some off-site work required. The off-site improvements are ongoing activities for the utility companies and should not have an adverse effect on their ability to service other areas. Cables and ducts will be suitable for underground applications and will be tolerant of both wet and dry conditions. All electrical and communications utility systems will be constructed and maintained according to approved utility standards. On-site facilities will have minimal impact on the environment, as noise, aesthetic, and safety considerations will be within normally applied guidelines.

Electrical Facilities. Electrical facilities will be installed to provide electricity for the Waiohuli Homestead Community. Electrical service will be provided by MECO. The existing DHHL Kēōkea and Waiohuli Subdivision is currently served by a 12.47-kilovolt (kV) line from MECO's Kula Substation. According to MECO, this substation is nearly filled to capacity and the addition of the project's anticipated electrical load demand will

impact its system. An electrical line extension and other upgrades will be necessary to accommodate this project.

In compliance with Chapter 344 (State Environmental Policy) and Chapter 226 (Hawaii State Planning Act), HRS, all project buildings, activities, and site grounds will be designed with energy-saving considerations. Energy-efficient design practices and technologies will be specifically addressed in the design phase of the proposed project. Electrical drawings and a project schedule will be submitted to MECO as soon as practical. Street-lighting facilities will be energized by the DHHL and licensed to and maintained by MECO.

Communications Facilities. SIC has an exclusive license to provide telecommunication services to new developments on Hawaiian home lands. All telecommunication infrastructure (i.e., underground conduits, handholes, and cabling) will be installed by SIC, at no cost to the DHHL, and will be connected to the nearby SIC telephone office building. The proposed project is not expected to adversely affect SIC or other SIC service areas.

6.7 EDUCATIONAL FACILITIES

Public Schools. Public schools in the project area comprise the State Department of Education (DOE) Kekaulike Complex. Fall enrollments for these schools are shown in the following table. It should be noted that fall enrollment tends to be higher than school year enrollment, as students leave may throughout the school year. For example, fall enrollment at King Kekaulike High for the 2003 to 2004 school year was 1,379; however, the number of students enrolled for the entire school year was 1,287. Kula Elementary, Samuel Enoka Kalama Intermediate, and King Kekaulike High are located four, 12, and nine miles from the project site, respectively.

Table 4. Kekaulike Complex 2001 to 2005 Fall Enrollments

School Name	2001-2002	2002-2003	2003-2004	2004-2005
Ha'ikū Elementary	429	418	426	428
Kula Elementary	440	430	421	412
Makawao Elementary	514	489	489	455
Pa'ia Elementary	214	207	212	212
Pukalani Elementary	471	474	493	480
Samuel Enoka Kalama Intermediate	1,179	1,132	1,066	1,014
King Kekaulike High	1,459	1,413	1,379	1,380

Source: State of Hawai'i, Department of Education, *School Status and Improvement Report: School Year 2003-2004* (March 2005) and "Enrollment Count: Leeward Areas and Charter Schools Continue to Grow" (September 2004)

Private Schools. A high proportion of elementary-aged students in this region (35 percent in 2001) attend private schools. Private schools within 13 miles of the Waiohuli Homestead Community site include:

- Carden Academy – Upcountry (Grades K to 5);
- Clearview Christian Girl's School (Grades 6 to 8);
- Haleakala Waldorf (Grades K to 8);

- Kamehameha Schools – Maui (Grades K to 12);
- Montessori School of Maui (Grades K to 5);
- Seabury Hall (Grades 6 to 12); and
- St. Joseph School (Grades K to 5).

Potential Impacts and Mitigation Measures

The Waiohuli Homestead Community will likely introduce school-aged children who would enroll at Kula Elementary, Samuel Enoka Kalama Intermediate, and King Kekaulike High. Fall enrollments at these schools have declined since the 2001 to 2002 school year, according to the DOE *School Status and Improvement Report: School Year 2003-2004* (DOE 2005). With enrollment declining, existing schools should be able to accommodate new students that will reside in the proposed Waiohuli Homestead Community. Some future residents of the Waiohuli Homestead Community may already reside and attend public schools in the Kula area. In addition, some students may obtain geographic exemptions to attend schools within or outside of the King Kekaulike Complex, and others may enroll at private schools in the area. Therefore, new school-aged children associated with the proposed project are not expected to adversely affect existing educational facilities.

The DHHL *Maui Island Plan* (PBR HAWAII 2004) designated 30 acres within the Kēōkea/Waiohuli tract for an elementary and/or intermediate school. The location and size of the facility, grade levels, and development schedule have not yet been determined.

As noted by the Maui Police Department, with additional students residing in the Waiohuli Homestead Community and attending public schools in the area, traffic near these schools will affect the AM and PM peak traffic flows and the overall traffic level of service at the intersection of Haleakalā Highway and Kula Highway (Chapter 10.0). This impact was addressed in the TIAR included in Appendix E.

6.8 POLICE PROTECTION

The Upcountry area is served by officers dispatched from the Maui Police Department (MPD) Wailuku Station, located approximately 20 miles northwest of the Waiohuli Homestead Community site. In 1996, a Community Police Officer office was established for beat officers to serve the Kula community. However, according to the MPD (Chapter 10.0), due to promotions and retirements, the Kula Community Officer position has not been filled since 2001 and it is unknown when it will be filled. The office is located within the Kula Community Center on Kula Highway, approximately nine miles northeast of the project site, but is not staffed by an officer on a regular basis. Response time to the project area will therefore be delayed. Four patrol officers on eight-hour shifts provide police protection for the Makawao-Pukalani-Kula beats. These officers are also assigned to Ha'ikū and Pa'ia, and respond to emergency situations throughout the entire Upcountry region. The Makawao-Pukalani-Kula beat also includes a single community police officer permanently assigned to the area.

The Makawao Substation is located approximately eight miles north of the project site.

Potential Impacts and Mitigation Measures

Although some future residents of the proposed Waiohuli Homestead Community may already live in the Makawao-Pukalani-Kula Community Plan area, the project will likely introduce new residents to the area. As such, there will be an occasional and unavoidable need for police service; however, this increase in demand is not expected to be significant or to impact the level of service provided to other residents in the service area.

6.9 FIRE PROTECTION

Fire protective service for the proposed Waiohuli Homestead Community will be provided by the County of Maui Department of Fire Control's Kula Fire Station. The Kula Fire Station is located approximately five miles northeast of the project site and currently services portions of Pukalani, upper Kula, and the area toward Kēōkea. The Kula Fire Station is staffed by one officer, one driver, and three firefighters on each eight-hour shift.

The Makawao Fire Station is located approximately ten miles north of the site, and the Pa'ia Fire Station is located approximately 16 miles north of the site. These fire stations are both staffed with five firefighters and provide additional firefighting support for the Kula region. The Kahului Fire Station also supports the area when additional manpower is needed. The Kahului Fire Station is staffed by ten firefighters and also includes a rescue company.

Potential Impacts and Mitigation Measures

With the proposed Waiohuli Homestead Community, urban structures will eliminate the potential fire hazard from pasture and brush land existing on the site. However, the potential for fires in residential structures will increase where none currently exists. Consequently, there will be an occasional and unavoidable need for fire protection services, which will be provided by the Kula Fire Station. Structures will be built in compliance with Department of Fire Control standards and requirements. Twelve paved roadways (Roads A, E, F, G, G₁, G₂, H, J, K, L, L₁, and M) will be 40 to 50 feet in width and will accommodate the Department of Fire Control's equipment.

6.10 HOSPITALS/HEALTH CARE FACILITIES

Maui Memorial Hospital, the only major medical facility on the island, is located approximately 20 miles northeast of the Waiohuli Homestead Community site. This State facility provides general and acute emergency care.

Kula General Hospital is located approximately two miles southeast of the project site. It

is a State-owned geriatric facility providing long-term care for the elderly. Kula General Hospital has 110 beds and provides inpatient skilled nursing and intermediate care, developmentally disabled inpatient services, Alzheimer's and dementia care, family practice clinic services, physical and occupational therapy, outpatient services, and a pharmacy.

A 12-hour ambulance service is provided to residents of the Makawao-Pukalani-Kula and Pa'ia-Ha'ikū Community Plan areas. Converting this 12-hour service to a 24-hour service is a high priority, according to the *Public Facilities Assessment Update* (R.M. Towill Corporation 2002). During the other hours, ambulance service is provided by the Makawao ambulance or the nearest available unit from other hospitals.

Non-emergency medical facilities located in Makawao and Pukalani service Upcountry residents.

Potential Impacts and Mitigation Measures

The Waiohuli Homestead Community will likely introduce new residents to the Makawao-Pukalani-Kula Community Plan area, and there will be an occasional and unavoidable need for emergency medical services by these residents. However, it is unlikely that this demand will impact the level of service provided to other residents in the region. With ambulance service and non-emergency medical care provided nearby, existing hospitals and healthcare facilities in the region are adequate to accommodate residents of the proposed Waiohuli Homestead Community.

Emergency medical service providers will be able to access the property from Kula Highway and existing and proposed roadways within the DHHL Kēōkea/Waiohuli tract.

6.11 RECREATIONAL FACILITIES

County parks in the Upcountry area include five neighborhood parks (Hāli'imaile Park, Kula Community Center, Waiakoa Gym, Harold Rice Memorial Park, and Kēōkea Ball Park) and three district parks (Eddie Tam Memorial Center, Pukalani Park and Community Center, and Kula Recreational Center). Polipoli State Park and Haleakalā National Park are located along higher elevations of Haleakalā. Other recreational facilities in the Upcountry area include four tennis courts, nine sports fields, three sports courts, five community centers, and three gymnasiums.

According to the County Department of Parks and Recreation (DPR), the Kula area is currently deficient in active fields for the existing population of approximately 7,200 (Chapter 10.0). Only Kēōkea Park with one multi-purpose field for soccer and baseball, and Kula Recreational Center with two multi-purpose fields for soccer and baseball currently serve the community.

Potential Impacts and Mitigation Measures

Using present population projection ratios, the DPR estimated that the Waiohuli Homestead Community, the Kula Residential Lots – Units 1 and 2, and the Kēōkea Agricultural Lots will generate a population of between 2,200 and 2,500 people and a demand for two tennis courts, three sport courts, and one large multi-purpose field (Chapter 10.0). It should be noted that while this project is exempt from the Maui County Code Park Dedication Requirements, the DHHL is proposing a 2.5-acre park within the Kula Residential Lots. Additionally, of the approximately 523 acres comprising the Waiohuli Homestead Community site, only 196 acres will be developed for the proposed community. The remaining lands would be used for open space (125 acres), archaeological/cultural preserves (100 acres), and ranching/grazing (100 acres) (Figure 3).

6.12 COMMUNITY SERVICES

Community services and public facilities in the vicinity of the Waiohuli Homestead Community site include the following:

- Several public and private schools (see Section 6.7);
- Maui Police Department Community Police Officer Office and Makawao Station (see Section 6.8);
- Maui Department of Fire Control Kula Fire Station, Makawao Fire Station, and Pa'ia Fire Station (see Section 6.9);
- Hospitals/healthcare facilities including the Kula General Hospital and Maui Memorial Hospital (see Section 6.10);
- Ambulance service in Kula and Makawao, and from other hospitals (see Section 6.10);
- Several recreational facilities (see Section 6.11);
- Churches in Kula;
- A public library in Makawao;
- Post office on Kula Highway; and
- Commercial centers in Pukalani and Makawao.

Potential Impacts and Mitigation Measures

The proposed Waiohuli Homestead Community is not expected to have any adverse impact on community services. Anticipated impacts on public and private schools, police and fire facilities, hospitals and healthcare facilities, and recreational facilities were previously discussed in this chapter. Mitigation measures were also identified to minimize potential impacts.

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7.0 SUMMARY OF CUMULATIVE AND SECONDARY IMPACTS

This chapter discusses the cumulative and secondary impacts of the DHHL projects in the Kēōkea/Waiohuli area.

7.1 EXISTING AND PLANNED PROJECTS

The following is a brief description of DHHL projects in Kēōkea/Waiohuli. These projects are shown in Figure 1.

Kula Residential Lots – Unit 1. This development (also referred to as Waiohuli Subdivision) is located directly north of the Waiohuli Homestead Community site. Kula Residential Lots – Unit 1 contains 321 completed lots that were built in 2000 and are either ready for occupancy or are already occupied.

Kula Residential Lots – Unit 2. An additional 99 in-fill lots are planned to be developed.

Kēōkea Agricultural Lots – Unit 1. The DHHL also plans to develop 69 agricultural lots directly south of the Waiohuli Homestead Community site.

Waiohuli Homestead Community. The DHHL is proposing to develop 337 residential lots on approximately 196 acres of a 523-acre site between the Kula Residential Lots – Units 1 and 2 and the Kēōkea Agricultural Lots – Unit 1.

7.2 POTENTIAL IMPACTS

This section discusses the potential cumulative and secondary environmental impacts resulting from the DHHL projects in Kēōkea/Waiohuli.

Climate, Topography, and Soils. Existing and planned developments in the project area are not expected to adversely impact regional climate, topography, and soils. Within their respective project sites, construction will impact topographic features and soils, and new structures may affect the micro-climate; however, the overall topography, soil, and climate of the Kēōkea/Waiohuli area are not expected to be affected.

Agricultural Impact. Some agricultural land in the project area has been or will be lost for these developments, but this loss includes land primarily used for grazing. The Kēōkea Agricultural Lots will include 69 agricultural lots, and additional agricultural land is available in the Kēōkea/Waiohuli area and elsewhere on Maui. The limiting factor to the growth of diversified agriculture in Hawai'i is not the land supply, but rather the size of the market for those crops than can be grown profitably. Agriculture in the project area is also limited by the availability of irrigation water. Based on the ample supply of land suitable for diversified agriculture on Maui, the relative lack of market demand (compared

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to the supply available), and the limited availability of irrigation water in the project area, cumulative and secondary impacts on agriculture are not expected to be significant.

Groundwater Resources/Hydrology. Collectively, the Kula Residential Lots – Units 1 and 2, the Kēōkea Agricultural Lots, and the Waiohuli Homestead Community are not expected to have an adverse cumulative or secondary impact on groundwater quality and hydrology. According to the County of Maui DWS, the anticipated consumption for the proposed Waiohuli Homestead Community would be approximately 202,200 gpd by system standards (Chapter 10.0). Approximately 202,350 gpd are available under the Water Credits Agreement (WCA) between the DHHL and the DWS after water is allocated to the Kula Residential Lots – Units 1 and 2, Kēōkea Agricultural Lots, and a proposed 2.5-acre park within the Kula Residential Lots.

Drainage. The Kēōkea/Waiohuli projects will increase the area of impervious surfaces; however, on-site drainage facilities such as detention basins will maintain pre-development runoff levels at each site and will prevent large runoff quantities during most storm events.

Natural Hazards. The combined residential and agricultural projects will not expose the residents to any additional hazard risk that does not already exist for the projects when considered individually.

Flora and Fauna. Impacts on flora and fauna are generally limited to the project sites. According to botanical surveys of the sites, there are no threatened or endangered plant species, nor any species of concern. Collectively, where necessary to accommodate residential and agricultural lots, the projects in the Kēōkea/Waiohuli area will remove vegetation, which is primarily dominated by introduced species and bears no resemblance to what species existed during the pre-contact era.

The majority of birds present on the project sites are introduced. Two native birds identified during avifaunal surveys are the Common Amakihi and the Pacific Golden-Plover, neither of which is listed as threatened or endangered. None of the mammals identified on the project sites are rare, threatened, or endangered. Existing animal species may be displaced or decline in abundance; however, other species (such as Common Mynas) may become more common, as some species prefer more developed areas.

Archaeological, Historic, and Cultural Resources. Archaeological surveys and cultural studies have been conducted for the DHHL projects in the Kēōkea/Waiohuli area, and no cumulative adverse impacts are anticipated. Inventory surveys, data recovery reports, preservation plans, burial treatment plans, and monitoring plans for each of the projects have been or will be completed. No cultural practices are known to take place on the project sites. Within the Waiohuli Homestead Community site, approximately 100 acres will be designated for archaeological/cultural preserves.

Noise. Construction of the projects in the Kēōkea/Waiohuli area will generate noise; however, construction of the Kula Residential Lots – Unit 1 is complete and construction

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of the Kula Residential Lots – Unit 2, the Kēōkea Agricultural Lots, and the Waiohuli Homestead Community is expected to occur at different times. Once construction is complete, noise will be generated from the residential and agricultural lots by daily activities and traffic along roadways. The cumulative impact of the projects will be an increase in noise, compared to existing conditions where land is used for cattle grazing. However, the proposed residential and agricultural uses are compatible with the existing rural character of the area.

Air Quality. During construction, fugitive dust from construction activities and equipment could impact air quality; however, dust control management plans will be developed for each project to mitigate potential impacts. After construction, air quality could be impacted by emissions from cars and equipment used to generate electricity. However, since there are no point sources of airborne emissions and northwesterly tradewinds are almost always present, air quality in the Kēōkea/Waiohuli area is very good and is not expected to be adversely impacted by the projects. Additionally, new technologies, increasingly stringent Federal air pollution regulations, and increased use of alternative forms of transportation may offset the potential increase in air pollution.

Visual Resources and Open Space. To some extent, the projects in the Kēōkea/Waiohuli area will change the visual appearance of cattle grazing land into agricultural and residential communities. However, visual resources are generally limited to the project sites, and within the approximately 523-acre Waiohuli Homestead Community site, only 196 acres will be developed. Existing views of the Central Maui plain and coastline from higher elevations within the Kēōkea/Waiohuli area will be maintained. Due to the low-density nature of the projects, the visual appearance of the projects from lower areas of Maui should not be significant in relation to the slopes of Haleakalā.

Population. Using present population projection ratios per residential unit, the County of Maui Department of Parks and Recreation estimated that the Kula Residential Lots – Units 1 and 2, the Kēōkea Agricultural Lots, and the Waiohuli Homestead Community will total 826 residential units and will generate a population of between 2,200 and 2,500. Collectively, the projects will increase population in the Makawao-Pukalani-Kula region. This population increase will cause an increase in the demand for public services. However, it is important to note that some future residents of these projects may already live in the Makawao-Pukalani-Kula region, and therefore, the cumulative population increase and demand for public services should be less than a project that would attract those who currently do not live on Maui. Build-out and occupancy of these projects will be accomplished over an eight- to ten-year time span resulting in gradual rather than abrupt impacts.

Housing. The *Maui Island Plan* beneficiary survey indicated that the majority of the beneficiaries (39.2 percent) preferred the Upcountry region for a residential homestead. Approximately 1,107 units are needed in Upcountry to meet surveyed beneficiary demand, and the projects in the Kēōkea/Waiohuli area will provide 757 residential lots and 69 agricultural lots to help meet this demand.

Lifestyle/Character of the Community. With the DHHL projects in the Kēōkea/Waiohuli area, the existing ranching lifestyle/character of the community will change to a residential and agricultural community, although some ranching will continue to occur. As noted in the cultural impact assessment for the Kēōkea Agricultural Lots, the conversion of land to agricultural and residential use (replacing more recent cattle grazing and other agricultural use) is consistent with the area's past use for similar purposes.

Economic Characteristics. In addition to providing home ownership opportunities to native Hawaiians, the projects in the Kēōkea/Waiohuli area will generate direct, indirect, and induced construction-related jobs island-wide and Statewide. Construction industries, as well as industries supporting construction, benefit from the employment and economic opportunities provided by the proposed developments. Additionally, nearby businesses in the Upcountry area would achieve significant economic gains, as construction workers and residents of the projects are expected to patronize them. The State will also benefit from the projects through the generation of income tax by those employed during the construction of the projects and general excise tax revenues.

Transportation Facilities. The TIAR for the Waiohuli Homestead Community assessed the cumulative impact of proposed and planned projects on existing traffic conditions. The TIAR identified three projects in the Pukalani area and three projects in the Kula and Waiohuli areas that would generate additional traffic within the study area. Projects in the Pukalani area include the Upcountry Town Center (which has since been cancelled), Kamehameha Schools and Kulamalu, and Kauhale Lani. Projects in the Kula and Waiohuli areas include the Kula Residential Lots – Units 1 and 2 and the Kēōkea Agricultural Lots. The TIAR concluded that although the Waiohuli Homestead Community will not significantly impact the level-of-service of any of the study intersections, background levels-of-service (which considers existing and other proposed or planned developments in the area) at four intersections will be below acceptable. These intersections are: 1) Haleakalā Highway at Kula Highway; 2) Haleakalā Highway at Makawao Avenue; 3) Haleakalā Highway at Hanā Highway; and 4) Kula Highway at King Kekaulike High School. Therefore, the cumulative impact of projects in Kula, Kēōkea, and Waiohuli will be an increase in traffic and demand on transportation facilities. However, as previously noted, occupancy of the DHHL projects will occur over many years.

Water Supply Facilities. Existing and planned DHHL projects in the Kēōkea/Waiohuli area will not have a cumulative adverse impact on water facilities, as the existing WCA between DHHL and DWS will provide DHHL with up to 500,000 gallons of potable water per average day for its Kula, Kēōkea, and Waiohuli developments. Therefore, the amount of water available under the WCA limits the cumulative number of lots that can be developed.

Wastewater Facilities. Since the Makawao-Pukalani-Kula region is not currently serviced by a County wastewater treatment system, DHHL projects in the Kēōkea/Waiohuli area will use individual waste disposal systems in compliance with the conditions listed in the Decision and Order for Docket No. 04-VWW-02 (granted on August 26, 2004) allowing the systems.

Drainage Facilities. The projects in Kēōkea/Waiohuli will increase the area of impervious surfaces. However, no significant impacts on drainage are anticipated, as on-site drainage facilities will be sized to control runoff in excess of estimated pre-development quantities and all of the DHHL projects proposed are of a low-density nature with minimal roads and paved parking.

Solid Waste Disposal Facilities. As the population of Maui grows, demand on the Central Maui Landfill will increase irrespective of where new development occurs. Solid waste will be generated by the projects in Kēōkea/Waiohuli; however, the projects are not expected to have a cumulative adverse impact on the Central Maui Landfill, which has adequate capacity to accommodate commercial and residential waste through the year 2020, with a surplus capacity of approximately one million cubic yards of landfill space. Additionally, approximately 46 percent of applicants for Hawaiian home lands on Maui already reside on Maui and would not contribute new loads to the landfill. As previously noted, occupancy of the DHHL projects will occur over many years, resulting in gradual rather than abrupt impacts.

Electrical and Communications Facilities. Any increase in demand for electricity not generated by renewable resources will have an indirect impact on air quality. However, the use of energy-saving features will be encouraged to efficiently use electricity and minimize air quality impacts. The new projects will increase the demand for communications service, but Sandwich Isles Communications, Inc. provides the communications infrastructure at all DHHL projects statewide and existing projects are not expected to have an adverse effect on existing communications systems in the area.

Educational Facilities. The Kula Residential Lots, the Kēōkea Agricultural Lots, and the Waiohuli Homestead Community will introduce school-aged children who would likely enroll at Kula Elementary, Samuel Enoka Kalama Intermediate, and King Kekaulike High. Fall enrollments at these public schools have declined since the 2001 to 2002 school year; therefore, existing schools should be able to accommodate new students that will reside in the Kēōkea/Waiohuli area. Collectively, the projects are not expected to adversely impact educational facilities, as some future residents of these developments may already reside and attend public schools in the Kula area, and others may obtain geographic exemptions to attend schools within or outside of the King Kekaulike Complex. Additionally, others may enroll at private schools in the area.

With additional students residing in the area, traffic near schools will likely increase during the AM and PM peak traffic hours, although this increase may occur over several years with absorption of the projects.

Police Protection. Incidents requiring police protection or service are unavoidable, but are expected to be infrequent. Since the Community Police Officer position at the Kula Community Center is not filled, the projects will increase the demand on the Wailuku Station, which is located approximately 20 miles northwest of Kēōkea/Waiohuli.

Fire Protection. Unavoidable fires and emergency situations would require protective service from the Maui County Department of Fire Control. With the proposed projects, there will be an increase in demand for fire protection services, which is provided by the Kula Fire Station. However, to prevent fires, structures will be built in compliance with Department of Fire Control standards and requirements. The projects' water transmission system will include fire hydrants per current DWS requirements.

Hospitals/Health Care Facilities. Accidents requiring medical attention are unavoidable, but are expected to be infrequent. Since the projects will introduce new residents to the area, they will also increase the demand on medical facilities including Maui Memorial Hospital, Kula General Hospital, healthcare facilities in Makawao and Pukalani, and ambulance service provided to residents of the Makawao-Pukalani-Kula and Pa'ia-Ha'ikū Community Plan areas.

Recreational Facilities. Existing and planned DHHL projects in the Kēōkea/Waiohuli area will increase population and the demand for recreational facilities in the Makawao-Pukalani-Kula region. In accordance with the HHCA, 1920, as amended, Hawaiian home lands are not subject to land use controls by the State or County, including park requirements. However, there are long-term plans for recreational facilities within the area, including a 2.5-acre park proposed within the Kula Residential Lots.

Community Services. Since the population of the Makawao-Pukalani-Kula region will increase with the DHHL projects in the Kēōkea/Waiohuli area, the demand for community services and facilities, such as post offices, libraries, churches, community centers, and shopping centers, will increase. However, absorption of the projects is likely to occur over several years and existing facilities in Kula, Pukalani, and Makawao should be able to accommodate residents of the Kēōkea/Waiohuli area.

8.0 ALTERNATIVES TO THE PROPOSED ACTION

8.1 ALTERNATIVES CONSIDERED

Under Section 11-200-10(6), HAR, Environmental Impact Statement Rules, the alternatives to the proposed action considered are limited to those that would allow the objectives of the project to be met, while minimizing potential adverse environmental impacts. The feasible alternatives must also address the project's economic characteristics while responding to the surrounding land uses that will be impacted by the project. In conformance with applicable regulations, the following alternatives, including alternative sites and uses of the property, have been identified and investigated.

8.2 ALTERNATIVE SITES

The DHHL has a limited amount of developable land for housing its beneficiaries. The Kēōkea/Waiohuli tract is the second largest of DHHL's land holdings on Maui. In the *DHHL Applicant Survey, 2003* (SMS 2004), Hawaiian home lands applicants indicated their location preference. The largest percentage of applicants preferred the Pa'ia, Ha'ikū, Upcountry Maui area to other areas on Maui.

Within the Kēōkea/Waiohuli tract are the Kula Residential Lots and the planned Kēōkea Agricultural Lots. Kula Residential Lots is an approximately 122-acre residential subdivision adjacent to and north of the project site, and Kēōkea Agricultural Lots is planned as an approximately 351-acre agricultural subdivision adjacent to and south of the project site. The proposed Waiohuli Homestead Community would provide additional residences to native Hawaiians in an area highly desired by Hawaiian home lands applicants. Of the approximately 523-acre project site, only about 196 acres would be developed to provide 337 single-family residential lots.

The DHHL is also developing lands in Waiehu and the Villages of Leiali'i in Lahaina.

8.3 "NO-ACTION" ALTERNATIVE

The mission statement of the DHHL is to manage the Hawaiian Home Lands trust effectively and to develop and deliver land to native Hawaiians. The "no-action" alternative would prevent the DHHL from fulfilling its mission of providing land to native Hawaiian beneficiaries on the DHHL waiting list. This alternative would forego opportunities for home ownership and the enhancement of residents' quality of life. Under this alternative, the site would continue to be used for cattle grazing, underutilized in terms of the positive socio-economic benefits that the proposed project would provide. Therefore, the no-action alternative has been rejected from further consideration.

8.4 ALTERNATIVES RELATED TO DIFFERENT DESIGNS OR DETAILS OF THE PROPOSED ACTIONS WHICH WOULD PRESENT DIFFERENT ENVIRONMENTAL IMPACTS

Approximately 196 acres of the 523-acre project site will be developed for the Waiohuli Homestead Community. About 337 residential lots will be developed, based on the water supply available under the Water Credits Agreement between the DHHL and the DWS.

Different designs related to density and design capacity could be applied to the proposed project and would result in different environmental impacts. For example, a higher density development would reduce the buildable area and quantity of surface runoff, although more land-efficient, multi-family dwellings would not be appropriate to the rural character of the surrounding area. The quantities of water used and solid waste, wastewater, and traffic generated would also be greater with a higher density design (significantly more units per acre than proposed). With a lower density than what is proposed, infrastructure costs would be greater since the development would be spread out.

8.5 ACTIONS OF A SIGNIFICANTLY DIFFERENT NATURE WHICH WOULD PROVIDE SIMILAR BENEFITS WITH DIFFERENT ENVIRONMENTAL IMPACTS

There are no known actions significantly different than the proposed Waiohuli Homestead Community that would provide the same level of housing opportunities for native Hawaiians. In other areas of the State, depending on the environmental conditions and the availability of infrastructure, DHHL lands are used for agricultural (including ranching), industrial, or public use (such as community centers and preschools). All of these uses would benefit DHHL programs and beneficiaries, but each would have different environmental impacts. The proposed project would help fulfill the high demand for Hawaiian home lands in this area, which has been planned for residential and agricultural use.

8.6 THE ALTERNATIVE OF POSTPONING ACTION PENDING FURTHER STUDY

Development of the project area has been planned and studied by the DHHL. The *Maui Island Plan* (PBR HAWAII 2004) provided a detailed assessment of all of DHHL's landholdings in Maui. Environmental assessments of the project area were also conducted for the Kula Residential Lots (Munekiyō & Hiraga 2005) and the Kēōkea Agricultural Lots – Unit 1 (SSFM 2001). These environmental assessments studied the impacts of residential and agricultural land uses in this area, and were subsequently issued with a FONSI. Further study of the area would not achieve the overall project objective and would delay the provision of housing opportunities to native Hawaiians.

9.0 DETERMINATION, FINDINGS, AND REASONS FOR SUPPORTING DETERMINATION

This EA has evaluated the potential primary, secondary, and cumulative environmental impacts, both short-term and long-term, that could result from the proposed Waiohuli Homestead Community. Mitigation measures have also been proposed to address potential impacts resulting from the project. Based on an assessment of existing research, the DHHL issued a FONSI.

9.1 DETERMINATION

Based on the significance criteria established by the *Hawaii Administrative Rules* and the assessment of potential environmental impacts, a FONSI was issued by the DHHL (Accepting Authority), pursuant to Chapter 343, HRS.

9.2 SIGNIFICANCE CRITERIA

According to the Section 11-200-12, HAR, Significance Criteria, an applicant or agency must determine whether an action may have a significant impact on the environment, including all phases of the project, its expected consequences both primary and secondary, its cumulative impact with other projects and its short and long-term effects. The HAR establish a “significance criteria” to determine whether significant environmental impact will occur as a result of a proposed action. An action shall be determined to have a significant impact on the environment if it meets any one of the following criteria:

- (1) Involves an irrevocable commitment to loss or destruction of any natural or cultural resources;**

Of the approximately 523-acre Waiohuli Homestead Community site, only 196 acres would be developed. The remaining lands would be used for open space (125 acres), archaeological/cultural preserves (100 acres), and ranching/grazing (100 acres) (Figure 3). Within the developable 196-acre area, natural resources would be permanently lost, but important cultural resources may be preserved by reconfiguring the conceptual plan. Several archaeological studies have been conducted for the project area and have been coordinated with the SHPD. The DHHL will continue to work with the SHPD and other agencies to ensure the appropriate design and construction of the project.

No endangered or threatened avian or mammalian species were observed during the wildlife survey, and none are expected to be affected by the proposed Waiohuli Homestead Community. The USFWS has not designated any critical habitat areas within the project site or the larger Kēōkea/Waiohuli tract, and the DHHL has licensed the Tri-Isle Resource Conservation Development Council to protect and restore the forest near the Pu‘u-o-kali cinder cone (west of the project site but within the DHHL Kēōkea/Waiohuli

tract).

Furthermore, the number of residential lots that can be developed is limited by the water supply available under the Water Credits Agreement between the DHHL and the DWS. As such, existing available water resources will not be depleted.

(2) Curtails the range of beneficial uses of the environment;

The Waiohuli Homestead Community site is currently undeveloped and used for cattle grazing. Residential use of the site would provide affordable housing to native Hawaiians and help to ease the statewide shortage of housing, as residences vacated by DHHL beneficiaries will become available to the general population once DHHL beneficiaries move to their homestead lots. In terms of socio-economic benefits that would be provided with the proposed project, the site is underutilized. The proposed project is not expected to adversely impact the natural environment, and much of the 523-acre site would remain undeveloped.

(3) Conflicts with the State's long-term environmental policies or goals and guidelines as expressed in Chapter 344, HRS; and any revisions thereof and amendments thereto, court decisions, or executive orders;

The proposed project is consistent with the environmental policies, goals, and guidelines established in Chapter 344, HRS, and this EA has addressed such issues as: natural resources conservation (to the extent possible); enhancement of the quality of life; population; land, water, visual, air, and other natural resources; flora and fauna; parks, recreation, and open space; economic development; transportation; energy; community life and housing; education and culture; and citizen participation.

(4) Substantially affects the economic welfare, social welfare, or cultural practices of the community or state;

The proposed project will positively affect the economic and social welfare of the native Hawaiian community by providing housing opportunities in a highly desirable area. The Waiohuli Homestead Community will be developed on approximately 196 acres and will include about 337 single-family residential units. This project will also affect the economic and social welfare of the State by adding to the statewide inventory of housing.

Construction of Waiohuli Homestead Community will also benefit the State by creating temporary jobs and increasing sales within the construction industry. Income taxes and sales taxes from the expenditure of construction employees' wages will be generated as a result of this development.

The proposed Waiohuli Homestead Community is not expected to affect the lifestyle and character of the Kula region, and the project is consistent with the *Makawao-Pukalani-Kula Community Plan* goal for the "immediate implementation of programs and settlement of Native Hawaiians on lands of the Department of Hawaiian Home Lands."

WAIOHULI HOMESTEAD COMMUNITY
FINAL ENVIRONMENTAL ASSESSMENT/FINDING OF NO SIGNIFICANT IMPACT

Cultural practices are not likely to be impacted by the Waiohuli Homestead Community, as many of the culturally significant sites, such as heiau and ahu (altars, shrines), were destroyed by ranching and agricultural activities on the property. The conversion of land to residential use is consistent with the area's past use for similar purposes.

(5) Substantially affects public health;

Construction of Waiohuli Homestead Community may pose the potential for temporary impacts to noise and air and water quality levels; however, these potential impacts will be short-term and are not expected to substantially affect public health. All construction activities will comply with applicable regulations and will implement appropriate mitigation measures as necessary. After construction, the Waiohuli Homestead Community should have minimal impact on ambient noise levels or air and water quality.

(6) Involves substantial secondary impacts, such as population changes or effects on public facilities;

The proposed DHHL Waiohuli Homestead Community will provide eligible native Hawaiians with much needed single-family residences. Approximately 46 percent of applicants for Hawaiian home lands on Maui currently reside on Maui. Although the proposed development will likely introduce new residents to Maui, the demand for energy and water, as well as solid waste and wastewater generation, should not increase significantly, either regionally or island-wide.

(7) Involves a substantial degradation of environmental quality;

The proposed project is not expected to substantially degrade environmental quality. Of the approximately 523-acre site, only 196 acres would be developed. The remaining land would be maintained in its existing condition. Potential impacts to the environment resulting from development, and appropriate mitigation measures have been identified throughout this EA.

(8) Is individually limited but cumulatively has considerable effect on the environment, or involves a commitment for larger actions;

Since much of the Upcountry region has been historically used for agricultural and cattle grazing purposes that altered the natural environment, the DHHL Waiohuli Homestead Community and other developments planned in the area are not expected to have a cumulative or considerable adverse impact on the environment. The 523-acre site includes no threatened or endangered plant or animal species, and only 196 acres are proposed for residential development.

(9) Substantially affects a rare, threatened or endangered species or its habitat;

WAIOHULI HOMESTEAD COMMUNITY
FINAL ENVIRONMENTAL ASSESSMENT/FINDING OF NO SIGNIFICANT IMPACT

No endangered or threatened avian or mammalian species are expected to be affected by the proposed Waiohuli Homestead Community. Vegetation within the 523-acre project site is dominated by introduced and evasive species, and only 196 acres are proposed for residential development.

(10) Detrimentially affects air or water quality or ambient noise levels;

Construction activities for development of the Waiohuli Homestead Community could potentially impact noise and air and water quality levels (i.e., fugitive dust from grading work, noise and exhaust emissions from construction equipment and vehicles). However, these potential impacts will be short-term and are not expected to be detrimental. All construction activities will comply with applicable regulations and will implement appropriate mitigation measures as necessary.

After construction, the Waiohuli Homestead Community is not expected to adversely impact ambient noise levels or water and air quality. Although impervious surfaces will be created on currently undeveloped land, any increase in runoff would be accommodated by proposed drainage improvements and should not detrimentally affect water quality. The project will also introduce motorized vehicles, which could impact noise levels and air quality. However, no long-term regional air quality impacts are anticipated, as new technologies, increasingly stringent Federal air pollution control regulations, and walking and biking may offset potential increases in air pollution.

(11) Affects or is likely to suffer damage by being located in an environmentally sensitive area, such as a flood plain, tsunami zone, beach, erosion-prone area, geologically hazardous land, estuary, freshwater, or coastal waters.

The Waiohuli Homestead Community site is located in Upcountry Maui on the relatively arid southwestern slopes of Haleakalā. The project site is not located in an environmentally-sensitive area such as a flood plain, tsunami zone, beach, erosion-prone area, geologically hazardous land, estuary, fresh water, or coastal waters and would therefore have no adverse impacts upon such areas. The project site is located in Zone C, which are areas of minimal flooding (Figure 6).

(12) Substantially affects scenic vistas and view planes identified in county or state plans or studies;

The Kula region includes a diverse range of scenic vistas and open expanses which typify the rural character of the region. The Waiohuli Homestead Community site is located at higher elevations and offers views of the Central Maui plain and coastline. The visual appearance of a portion of the project site will change from cattle grazing land to a residential community. Since only 196 acres of the approximately 523-acre site will be developed, open space and visual resources will be preserved. Existing views of the Central Maui plain and coastline from higher elevations within the project site will be maintained.

(13) Requires substantial energy consumption.

Construction of the proposed Waiohuli Homestead Community is not expected to require substantially more energy than other projects of similar size and scale. Structures will be designed to incorporate energy-saving technologies, and since the majority of beneficiaries on the Maui Residential Waitlist currently reside on Maui, demand for energy should not increase significantly.

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10.0 CONSULTATION

10.1 AGENCIES/INDIVIDUALS CONSULTED IN THE PREPARATION OF THE DRAFT ENVIRONMENTAL ASSESSMENT

Agencies (or agency documents) and individuals consulted in the preparation of the DEA are listed below.

State of Hawai'i

- Department of Agriculture
- Department of Business, Economic Development and Tourism, Land Use Commission
- Department of Health (Hawaii Administrative Rules)
- Department of Land and Natural Resources, Historic Preservation Division
- University of Hawai'i, Land Study Bureau

County of Maui

- Department of Planning
- Department of Water Supply

Federal

- Department of Agriculture, Natural Resource Conservation Service
- Federal Emergency Management Agency
- U.S. Fish and Wildlife Service
- U.S. Geological Survey

Individuals

- Mr. David "Haha" Kalahanohano Fernandez
- Ms. Hokulani Holt-Padilla.
- Mr. James K. Kapohakimohewa
- Mr. Wayne Lu
- Mr. Fredrick Ventura
- Mr. Kenneth Ventura

The DEA was distributed to various agencies and published in the June 8, 2005 issue of the OEQC's *The Environmental Notice*, commencing a 30-day public review period that ended on July 7, 2005.

10.2 AGENCIES/INDIVIDUALS CONSULTED IN THE PREPARATION OF THE FINAL ENVIRONMENTAL ASSESSMENT

Comments received on the DEA and appropriate responses are included in this chapter.

WAIOHULI HOMESTEAD COMMUNITY
FINAL ENVIRONMENTAL ASSESSMENT/FINDING OF NO SIGNIFICANT IMPACT

AGENCY		DEA Distribution	Date of Comments
State			
1	Department of Business, Economic Development and Tourism	06-02-05	--
2	Department of Business, Economic Development and Tourism – Office of Planning	06-02-05	--
3	Department of Health – Environmental Planning Office	06-02-05	06-30-05
4	Department of Health – Office of Environmental Quality Control	06-02-05	06-30-05
5	Department of Land and Natural Resources	06-02-05	--
6	Department of Land and Natural Resources – Historic Preservation Division	06-02-05	--
7	Department of Transportation	06-02-05	--
8	Office of Hawaiian Affairs	06-02-05	06-23-05
9	State Council of Hawaiian Homestead Associations	06-02-05	--
Federal			
10	U.S. Army Corps of Engineers	06-02-05	--
11	U.S. Fish and Wildlife Service	06-02-05	--
County			
12	County Councilmember Charmaine Tavares	06-02-05	--
13	Department of Fire Control	06-02-05	--
14	Department of Housing and Human Concerns	06-02-05	--
15	Department of Parks and Recreation	06-02-05	07-01-05
16	Department of Planning	06-02-05	07-07-05
17	Department of Public Works and Environmental Management	06-02-05	07-08-05
18	Department of Water Supply	06-02-05	07-01-05
19	Police Department	06-02-05	06-16-05
Other Organizations			
20	Hui Kako'o Aina Ho'opulapula	06-02-05	--
21	Keokea Hawaiian Homes Farmers Association	06-02-05	--
22	Maui Electric Company, Ltd.	06-02-05	06-07-05
23	Sandwich Isles Communications, Inc.	06-02-05	--
24	Waiohuli Hawaiian Homesteaders, Inc.	06-02-05	--
Libraries			
25	Makawao Public Library	06-02-05	--

LINDA LINGLE
GOVERNOR OF HAWAII



CHYOME L. FUKINO, M.D.
DIRECTOR OF HEALTH

JUN 07 2005

STATE OF HAWAII
DEPARTMENT OF HEALTH
P.O. Box 3378
HONOLULU, HAWAII 96801-3378

June 30, 2005

Ms. Lacey Kazama
PBR Hawaii
1001 Bishop Street
ASB Tower, Suite 650
Honolulu, HI 96813

Dear Ms. Kazama:

SUBJECT: Draft Environmental Assessment
Waiohuli Homestead Community
Waiohuli, Upcountry, Maui, Hawaii
TMK: 2-2-002: portion 014 and 055, 523 acres

Thank you for allowing us to review and comment on the subject document. Please see the enclosed comments and previous correspondences regarding the subject project from our Wastewater Branch. Also, please refer to our website for the Standard Comments (<http://www.state.hi.us/health/environmental/env-planning/landuse/landuse.html>). If there are any questions about these standard comments please contact Jiakai Liu with the Environmental Planning Office at 586-4346.

Sincerely,

Jane F. Harrigan - lum

JUNE F. HARRIGAN-LUM, MANAGER
Environmental Planning Office

Enclosures

c: EPO
HEER
WWB

LINDA LINGLE
GOVERNOR OF HAWAII



STATE OF HAWAII
DEPARTMENT OF HEALTH
P.O. BOX 3378
HONOLULU, HAWAII 96801

June 24, 2005

TO: Jiakai Liu, Staff, Environmental Planning Office
email: jliu@eha.health.state.hi.us

FROM: Harold Yee, Branch Chief, Wastewater Branch *HY*

SUBJECT: Draft Environmental Assessment for Waiohuli Homestead Community
Upcountry, Kula, Maui, Hawaii
Proposed Use: Single Family Residential and Archaeological Preserves
TMK: (2) 2-2-002: 014 portion and 55 portion approx. 523 acres

We have reviewed the subject document which proposes developing a livable community for native Hawaiians consisting of 337 family residential lots.

We have the following comments to offer. The subject project is located in the Non-Critical Wastewater Disposal Area (CWDA) as determined by the Maui County Wastewater Advisory Committee. Please see the enclosed Variance Application No. WW 150, Docket No. 04-VWW-02, Decision & Order and Findings of Fact and Conclusions of Law which was granted on August 26, 2004. Therefore, we have no objections to the proposed project provided that wastewater treatment and disposal follows the conditions listed in the Decision & Order.

All wastewater plans must conform to applicable provisions of the Department of Health's Administrative Rules, Chapter 11-62, "Wastewater Systems." We do reserve the right to review the detailed wastewater plans for conformance to applicable rules. Should you have any questions, please contact the Planning & Design Section of the Wastewater Branch at 586-4294.

LNKM:ern

Enclosure: Cover Letter addressed to Mr. Anson Maruyama, Community Planning, dated August 27, 2004
Decision & Order, granted on August 26, 2004
Findings of Fact and Conclusions of Law, signed on August 26, 2004.

CHYOME L. FUKINO, M.D.
DIRECTOR OF HEALTH

In reply, please refer to:
EPO-05-051

M2 2 002 014
D:W13 WHO50503
REF #EPO 05-051

LINDA LINGLE
GOVERNOR OF HAWAII



STATE OF HAWAII
DEPARTMENT OF HEALTH

P.O. BOX 3378
HONOLULU, HAWAII 96801

August 27, 2004

CERTIFIED MAIL 7002 3150 0001 6551 0095
RETURN RECEIPT REQUESTED

Mr. Anson Maruyama, P.E.
Community Planning, Inc.
745 Fort Street, Suite 400
Honolulu, Hawaii 96813

Dear Mr. Maruyama:

Subject: Variance Application No. WW 150
Docket No. 04-VWW-02

State of Hawaii - Department of Hawaiian Home Lands
Allow the Use of Individual Waste Disposal Systems in a
Subdivision of Greater than 50 Lots
Keokea Farm Lots, off Kula Highway, Kula, Maui, Hawaii
TMK: (2) 2-2-002: 014, 055 and 071

Please find enclosed the Department of Health's Decision and Order regarding the above mentioned variance request which was **GRANTED** on AUG 26 2004. We are enclosing for your information the Findings of Fact and Conclusions of Law.

Please note the variance conditions and if there are any questions relative to the variance, please do not hesitate to contact Mr. Harold Yee, Chief or Ms. Lori Kajiwarra, Planning & Design Section Planner of the Wastewater Branch at our direct toll on Maui 984-2400, ext. 64294, or on Oahu at (808)586-4294, fax (808)586-4300.

Sincerely,

Thomas E. Arizumi

THOMAS E. ARIZUMI, P.E., CHIEF
Environmental Management Division

Enclosures: Decision and Order
Findings of Fact and Conclusions of Law

c: Deputy Director for Environmental Health
Attorney General's Office
Department of Water - County of Maui
Clean Water Branch
District Health Office - Maui
Environmental Planning Office
Safe Drinking Water Branch

CHRYSLER L. FURUKAWA, M.D.
DIRECTOR OF HEALTH

In reply, please refer to:
EMD/IWS

WW 150 Final Dec CLwpd
V15 WB040736

STATE OF HAWAII

DEPARTMENT OF HEALTH

In the Matter of the Application)
Variance Application No. WW 150)
for Individual Wastewater System)
State of Hawaii)
Department of Hawaiian Home Lands)
Allow the Use of Individual Waste Disposal)
Systems in a Subdivision of Greater Than)
50 Lots, Keokea Farm Lots, off Kula)
Highway, Kula, Maui, Hawaii)
TMK: (2) 2-2-002: 014, 055 and 071)

Docket No. 04-VWW-02

DECISION AND ORDER

Pursuant to Chapter 342D, Hawaii Revised Statutes, and Chapter 62 of Title 11, Administrative Rules and based upon the application and staff review, the Variance Request from the provisions of Chapter 11-62, Section 11-62-23.1(c)(1) is hereby **GRANTED** with the following provisions:

1. Cesspools shall not be used as on-site individual wastewater system (IWS).
2. Lessees shall submit plans for each IWS to the Wastewater Branch for review and approval. IWS plans shall be stamped, signed and dated by a professional engineer licensed in the State of Hawaii. In addition, the IWS shall be approved in writing by the Department of Health before it can be placed into service.
3. All IWSs shall be inspected at least once every two (2) years or as specified by the IWS design engineer and pumped when necessary.
4. Low flow plumbing fixtures shall be required in all new dwellings. And
5. The development shall connect to a municipal sewer system should it become available to the area.

DATED: Honolulu, Hawaii, AUG 26 2004

Laurence K. Lau
Laurence K. Lau
Deputy Director for Environmental Health

STATE OF

DEPARTMENT OF HEALTH

In the Matter of the Application)
Variance Application No. WW 150)
for Individual Wastewater System)
)
State of Hawaii)
Department of Hawaiian Home Lands)
Allow the Use of Individual Waste Disposal)
Systems in a Subdivision of Greater Than)
50 Lots, Keokea Farm Lots, off Kula)
Highway, Kula, Maui, Hawaii)
TMK: (2) 2-2-002: 014, 055 and 071)

1. Attachment A-1

The applicant, the State of Hawaii, Department of Hawaiian Home Lands (DHHL), proposes to develop a subdivision of Hawaiian homestead lands in Keokea/Waiohuli, Kula, Maui, Hawaii.

The project site is located on the makai side of Kula Highway, approximately 3.6 miles southwest of the Kula post office. The development is situated 9 miles from Pukana town and 16.5 miles from the Kahului airport.

Parcels 14, 55 and 71 of Tax Map Key (2) 2-2-02 of approximately 5,452 acres of DHHL lands will be subdivided into 514 lots, as shown on Attachment F-1-2. The subdivision site will include 85 agricultural lots of minimum 2 acres, 420 residential 20,000 square foot minimum lots, two large Parcel 14 remainder lots, three Parcel 55 remainder lots, and four historic preserve lots, as well as proposed 40- and 50- foot roadways.

The variance is being requested as a modification to the previously approved 82-lot Keokea Agricultural Lots, Unit 1, development on March 6, 2002, per variance application No. 137 and Docket No. 01-VVW-04, to allow individual wastewater systems for the lots. The subdivided lots will be conveyed as agricultural and residential homesteads to eligible native Hawaiians for one dollar (\$1.00) a year. Other improvements include paved roadways, storm drainage system potable water system, overhead electric and lighting system, underground communication system, and road connection improvements on Kula Highway. The homesteader will be responsible for developing their individual lot including grading improvements, buildings, and individual waste disposal systems.

The surrounding area is sparsely populated. Low-density rural residential properties, small farms, and lands utilized for agricultural cultivation and ranch type activities characterize the land uses in the vicinity of the project.

The project is not located within an area designated by the Department of Health as a "Critical Wastewater Disposal Area."

FINDINGS OF FACT AND CONCLUSIONS OF LAW

An application from the designated agent, Community Planning, Inc., 745 Fort Street Suite 400, Honolulu, Hawaii 96813, for a five-year variance from Hawaii Administrative Rules, Chapter 62 of Title 11, Section 11-62-31.1(a)(1)(B) was reviewed by the Department of Health staff, and a public notice of the application was printed in the May 4, 2004 issues of the Honolulu Star Bulletin and The Maui News publications. Five (5) Department of Health agency comments, one (1) County of Maui agency, and no public comment pertaining to the application were received during the 30 days following the publication of the public notice.

Findings of Fact

The applicant, the State of Hawaii, Department of Hawaiian Home Lands (DHHL) at P.O. Box 1879, Honolulu, Oahu, Hawaii has applied for a five-year variance from the Hawaii Administrative Rules (HAR), Section 11-62-31.1(a)(1)(B) which states "Individual wastewater systems may be used ... under the following conditions ... Total development of an area shall not exceed fifty- single family lots or exceed fifty dwelling units."

The applicant is proposing to develop a subdivision on Hawaiian Homestead Lands in Keokea/Waiohuli, Kula, Maui, Hawaii at TMK: (2) 2-2-002: 014, 055 and 071 of approximately 5,452 acres of DHHL lands into 514 lots consisting of 85 agricultural

Previous soil investigations for the adjoining existing Kula Residence Lots and proposed Keokea Agricultural Lots Subdivision included percolation tests which support the use of septic wells. Consequently, it appears reasonable at this time that the project area between Waiohuli (the Kula Residence Lots) and Keokea will have a similar soils strata of a thin layer of ash overlying a 5- to 10- foot layer of basaltic sands, gravels and cobbles resting on basaltic rock. This assumption will be confirmed by additional soil investigations undertaken for the project for design of grading, roadways and septic wells. The applicable percolation test results and septic design recommendations for the previous soil investigations for Kula Residence Lots and Keokea Agricultural Lots are included in this application as Attachment F-1-4.

2. Attachment C-1

Compliance with Chapter 11-62 would require the construction of a wastewater treatment plant to process the subdivision's sewage. Building an on-site collection system and a sewage treatment plant would be very cost prohibitive and would result in economic hardship to DHHL, as well as the homesteaders. The estimated total construction cost for a secondary wastewater treatment facility and effluent disposal system, including sewer transmission mains and sewer laterals for 505 residential lots is approximately \$11,000,000. In comparison, the estimated total construction cost for Individual Wastewater Systems (IWS), consisting of 505 septic tank systems is approximately \$3,000,000. The nearest connection to a public sewer or to an ocean outfall is at least 7 miles away. DHHL, as part of their responsibility to the Hawaiian people, must also allocated large sums of monies to develop many other Hawaiian homestead lands, not only on Maui but also on the other islands in Hawaii.

Requiring a sewage treatment facility to service the project will not only result in much greater cost to the project but design, approvals and construction will also set the development process back several years without having any resulting benefits. The County would also have to operate and maintain the treatment plant. The County has historically chosen not to operate sewage treatment plants in the area. Neither DHHL nor the subdivision homesteaders can operate such a plant effectively and forcing them to do so would cause extreme hardship.

3. Attachment D-1

Allowing the use of individual septic systems will allow development in the area and provide much-needed homestead sites for residents of Hawaiian descent. It will allow DHHL to serve the beneficiaries of the

Hawaiian Home Lands trust by developing and delivering its lands. The project specifically addresses the demand for developed lots to provide native Hawaiians with homesteading opportunities on the island of Maui.

4. Attachment D-2

The homestead sites range in size from 20,000 square foot lots to those which are over 2 acres. These lot areas provide substantial area to safely and naturally dispose of domestic sewage. The project site is between elevation 2,900 and 2,230 feet and is located at least 7 miles away from the coastline. The domestic water source for the surrounding area and this site is the Piholo Reservoir. This reservoir is located at a higher elevation and approximately 3 miles away.

The project is not located within an area designated by the Department of Health as a "Critical Wastewater Disposal Area."

5. Attachment D-3

The DHHL Keokea parcel was originally subdivided and lots awarded to residents of Hawaiian descent. After several years of securing funding, plans were prepared for construction of the required roadways, storm drains and utilities. However, bids received in June 2002 produced a construction price far in excess of the budgeted funding for the 77 lots. Consequently, the Keokea project has been reconfigured and provided with a second access and gravity water service from the Kula Residence Lots (Waiohuli). To further reduce the unit lot cost, the DHHL parcel between Waiohuli and Keokea is also being developed to provide an approximate additional 420 lots with minimum area of 20,000 square feet for DHHL award.

Requiring a sewage treatment facility to service the project will not only result in much greater cost to the project but design, approvals and construction will also set the development process back several years without having any resulting benefits. The County would also have to operate and maintain the treatment plant. The County has historically chosen not to operate sewage treatment plants in the area. Neither DHHL nor the subdivision homesteaders can operate such a plant effectively and forcing them to do so would cause extreme hardship.

6. Attachment F-1

1. Project Location Map

2. Preliminary Site Plan
3. DOH "Critical Wastewater Disposal Areas Map, Island of Maui" with the project location
4. Existing Soil Investigation and Percolation Testing for:
 - a. Kula Residence Lots, Unit 1, by Ernest K. Hirata & Associates, August 22, 1995
 - b. Keokea Agricultural Lots, Unit 1, Subdivided by Dames & Moore, October 13, 1998

(Due to the length of the above, Attachment F-1 will not be included in this Findings of Fact and Conclusions of Law but will be available for viewing).

The following Department of Health and County of Maui agencies submitted the following comments:

1. The Safe Drinking Water Branch:
 - a. The project site is situated "mauka" or above the UIC line; therefore, it overlies a potable aquifer (also referred to as and underground source of drinking water). Chapter 11-23 prohibits the construction and operation of new sewage injection wells above the UIC line;
 - b. For clarity, the notice document should specify the type of disposal system to be used with the septic tank; and
 - c. We have no objection to this variance provided that it does not violate Chapter 11-23.

Please call us if you have any questions about this subject.

2. The Clean Water Branch:
 - a. Recommend to deny this variance application. At least the 420 residential, lots should be sewered.
3. The County of Maui, Department of Water Supply:

In response to your transmittal dated April 19, 2004 regarding the subject variance application, please be advised that the Department of Water

Supply has no comments on this variance.

Should you have any questions, please contact Herbert Chang of our engineering division at (808) 270-7835.

In response to the Draft Decision Cover Letter, Draft Decision & Order and Draft Findings of Fact and Conclusions of Law, the Department of Water Supply submitted the following comments:

Thank you for the opportunity on the subject Variance Application. We understand that Department of Health's recommendation is to grant treatment individual wastewater system (IWS) for the entire project, including 420 residential lots. We provide the following comments:

Septic systems pose a potential pollution threat to proposed drinking water sources in the area. There is a water shortage for the Upcountry system. The quality of additional ground water sources from the underlying aquifer is of crucial importance.

Should IWS be granted for the proposed project, we recommend that the following best management practice be made a condition in order to protect underlying ground water resources:

"Unless specified in operation and maintenance manual prepared pursuant to HAR 11-62-23 (g), septic systems should be inspected annually, and pumped when necessary."

The notice document does not discuss the option of connecting a sewer system across privately owned land to the Kihei Wastewater Treatment Plant, which is approximately 1.9 miles west of Parcel 2-2-02: 014.

Should you have any questions, please contact our Water Resources and Planning Division at (808) 270-7199.

4. The District Health Office - Maui:

I have no comments.

Herbert S. Matsubayashi, District Environmental Health Program Chief
5. The Wastewater Branch:
 - a. The subdivision consists of 50 lots/dwelling units or more. The use of individual wastewater systems is not allowed under the

provisions of Hawaii Administrative Rules, Chapter 11-62.

Roland Tejano, Wastewater Branch, Maui Office

- b. As the property is located in a non-critical wastewater disposal area as determined by the Maui Wastewater Advisory Committee, we have no objections to the proposed development. All lots must have a licensed engineer designed treatment individual wastewater treatment system (IWS) constructed on-site serving no more than five (5) bedrooms or bedroom like rooms.

Engineering Section, Wastewater Branch, Oahu Office

The maximum five (5) year duration for a variance is requested.

Conclusions of Law

Chapter 342D, Hawaii Revised Statutes, Section 342D-7(c), states that no variance shall be granted by the Department unless the application and supporting information clearly show that:

1. The granting of the variance is in the public interest as defined in the Hawaii Revised Statutes, Section 342D-6(c)(4).
2. The granting of this variance will not substantially endanger human health or safety.
3. Compliance with the rules, regulations or standards from which the variance is sought would produce serious hardship without equal or greater benefits to the public.

Based upon the foregoing findings of fact, it is concluded that the above requirements have been met.

Comment and Recommendation

Based upon the foregoing findings of fact and conclusions of law, it is my recommendation that the variance request be **GRANTED** with the following conditions:


1. Cesspools shall not be used as on-site individual wastewater system (IWS).
2. Lessees shall submit plans for each IWS to the Wastewater Branch for review and approval. IWS plans shall be stamped, signed and dated by a professional engineer licensed in the State of Hawaii. In addition, the

IWS shall be approved in writing by the Department of Health before it can be placed into service.

3. All IWSs shall be inspected at least once every two (2) years or as specified by the IWS design engineer and pumped when necessary.
4. Low flow plumbing fixtures shall be required in all new dwellings. And
5. The development shall connect to a municipal sewer system should it become available to the area.

AUG 26 2004

DATED: Honolulu, Hawaii, _____


Laurence K. Lau
Deputy Director for Environmental Health

LINDA LINGLE
GOVERNOR
STATE OF HAWAII



STATE OF HAWAII
DEPARTMENT OF HAWAIIAN HOME LANDS

P.O. BOX 1879
HONOLULU, HAWAII 96805

MICAH A. KANE
HAWAIIAN HOMES COMMISSION
BEN HENDERSON
DEPUTY TO THE CHAIRMAN
KAILANA H. PARK
EXECUTIVE ASSISTANT

TO: June F. Harrigan-Lum, Manager
Environmental Planning Office, Department of Health

FROM: Micah A. Kane, Chairman
Hawaiian Homes Commission

SUBJECT: Department of Hawaiian Home Lands (DHHL) Waiohuli
Homestead Community Final Environmental
Assessment/Finding of No Significant Impact (FONSI)

Thank you for your letter dated June 30, 2005 (your reference EPO-05-051). We have reviewed the Standard Comments as well as the comments from the Wastewater Branch. We offer the following responses to the Wastewater Branch comments.

1. We understand that the project is located in the Non-Critical Wastewater Disposal Area (CWDA) as determined by the Maui County Wastewater Advisory Committee, and the Wastewater Branch has no objections to the proposed project, provided that wastewater treatment and disposal follows the conditions of the Decision and Order for Variance Application No. WW 150, Docket No. 04-VWW-02, which was granted on August 26, 2004.

2. All wastewater plans will conform to applicable provisions of the Department of Health's Administrative Rules, Chapter 11-62, "Wastewater Systems". The Department of Health reserves the right to review the detailed wastewater plans for conformance to applicable rules. This will be noted in the Final EA

Thank you again for your participation in the Environmental Assessment process. If you have any questions regarding this project, please call Darrell Ing of our Land Development Division at 586-3844.

c: Anson Murayama, Community Planning and Engineering, Inc.
Lacey Kazama, PBR HAWAII

LINDA LINGLE
GOVERNOR OF HAWAII



STATE OF HAWAII
OFFICE OF ENVIRONMENTAL QUALITY CONTROL
DEPARTMENT OF HEALTH

LEOPAPA A. KAMEHAMEHA
238 SOUTH BERETANIA STREET, SUITE 702
HONOLULU, HAWAII 96813
TELEPHONE (808) 586-4185

GENEVEVE K.Y. SALMONSON
DIRECTOR OF DEHS

RECEIVED
JUN 11 2005
STATE OF HAWAII

In reply, please refer to:
File:

June 30, 2005

Mr. Micah Kane
Department of Hawaiian Home Lands, State of Hawaii
P.O. Box 1879
Honolulu, Hawaii 96805

Ms. Lacey Kazama
PBR Hawaii
1001 Bishop Street, Suite 650
Honolulu, Hawaii 96813

Dear Mr. Kane and Ms. Kazama:

The Office of Environmental Quality Control has received the draft environmental assessment for the Wai'ohuli Homestead Community, Tax Map Key 2-2-002:014 (portion) and 055 (portion), in the judicial district of Makawao and offers the following comments for your consideration and response.

CONTEMPORARY CULTURAL IMPACTS: The environmental assessment addresses the requirements of Chapter 6E, HRS, and the National Historic Preservation Act. These acts deal primarily with historic (past) resources and practices. Chapter 343, HRS, was amended in 2000 to provide for the discussion of contemporary (as opposed to past or historic) practices and resources. Please refer to our guidance on cultural impacts found on our website at <http://www.state.hi.us/health/oeqc/guidance/index.html>.

CUMULATIVE AND SECONDARY IMPACTS ANALYSIS: The current project is one of several Hawaiian Homes projects in the general region that have undergone Chapter 343, HRS, review. Please discuss cumulative and secondary impacts that the existing nearby projects may have on the present project and the general regional environment.

COMMUNITY CONSULTATION: Please consult with adjacent neighbors and community associations.

Thank you for the opportunity to comment. If there are any questions, please call Mr. Leslie Segundo, Environmental Health Specialist, at (808) 586-4185.

Sincerely,

Genevieve Salmon
GENEVEVE SALMONSON
Director

LINDA LINGLE
GOVERNOR
STATE OF HAWAII



STATE OF HAWAII
DEPARTMENT OF HAWAIIAN HOME LANDS

P.O. BOX 1879
HONOLULU, HAWAII 96805

MICAH A. KANE
CHAIRMAN
HAWAIIAN HOMES COMMISSION
BEN HENDERSON
DEPUTY TO THE CHAIRMAN
KAULANA H. PARK
EXECUTIVE ASSISTANT

July 27, 2005

TO: Genevieve Salmonson, Director
Office of Environmental Quality Control

FROM: Micah A. Kane, Chairman
Hawaiian Homes Commission

SUBJECT: Department of Hawaiian Home Lands (DHHL) Waiohuli
Homestead Community Final Environmental Assessment
/Finding of No Significant Impact (FONSI)

Thank you for your letter dated June 30, 2005. We offer the following responses to your comments.

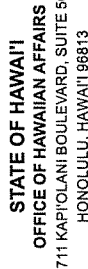
1. As discussed in the Draft EA (Section 5.2), many of the culturally significant sites, such as heiau and ahu (altars, shrines) no longer exist primarily due to the paniolo era in which cattle ranchers cleared much of the land. No contemporary cultural practices were noted in interviews conducted by the project's cultural consultant. Additionally, the cultural impact assessment prepared for the Keokea Agricultural Lots - Unit 1, located directly south of the project site, concluded that given the recent historical use for ranching and agriculture, Native Hawaiian cultural practices are no longer conducted on the property. The assessment further concluded that the conversion of land to agricultural and residential use (replacing more recent cattle grazing and other agricultural use) is consistent with the area's past use for similar purposes.
2. The Final EA will include a discussion of the potential cumulative and secondary impacts of existing nearby DHHL projects.

Ms. Genevieve Salmonson, Director
July 27, 2005
Page 2

3. The Draft EA was distributed to the State Council of Hawaiian Homestead Associations, Hui Kako'o Aina Ho'opulapula, Keokea Hawaiian Homesteaders Association, and Waiohuli Hawaiian Homesteaders, Inc. These organizations will be included in the list of consulted parties in the Final EA.

Thank you again for your participation in the Environmental Assessment process. If you have any questions regarding this project, please call Darrell Ing of our Land Development Division at 586-3844.

c: Anson Murayama, Community Planning and Engineering, Inc.
Lacey Kazama, PBR HAWAII



Lacey Kazama
PBR Hawaii
ASB Tower, Suite 650
1001 Bishop Street
Honolulu, HI 96813

Dear Lacey Kazama,

As was suggested in the Environmental Impact Statement, several efforts should be made to protect the archaeological resources in the area of proposed construction. An Archaeological Monitoring Plan, a Burial Treatment Plan and a Data Recovery effort should be completed prior to moving forward with the proposed project. OHA also recommends that all encountered human burials be preserved in-situ and that all ground altering activities be monitored by a professional archaeologist. It is also requested that the pre-contact historic properties, even after data recovery, not be destroyed unless absolutely necessary to accommodate housing for Native Hawaiians.

OHA also request that native flora be incorporated into the future landscaping plan. Four native plants in particular: 'Āwīkīwīki (*Canavalia pubescens*), Ko'oloa'ula (*Abutilon menziesii*), Iliana (*Bonania menziesii*) and Ma'o Hau Hele (*Hibiscus brackenridgei*) are present on the project area. These should be replanted and cultivated where possible to promote a native ecosystem in the Kula region.

Clyde W. Nāmu'o
Administrator

Ms. Genevieve Salmonson, Director
Office of Environmental Quality Control
235 South Beretania Street, Suite 702
Honolulu, HI 96813



STATE OF HAWAII
DEPARTMENT OF HAWAIIAN HOME LANDS

P.O. BOX 1879
HONOLULU, HAWAII 96805

MICAH A. KANE
CHAIRMAN
HAWAIIAN HOMES COMMISSION
BEN HENDERSON
DEPUTY TO THE CHAIRMAN
KAULANA H. PARK
EXECUTIVE ASSISTANT

July 27, 2005

TO: Clyde W. Namuo, Administrator
Office of Hawaiian Affairs

FROM: Micah A. Kane, Chairman
Hawaiian Homes Commission

SUBJECT: Department of Hawaiian Home Lands (DHHL) Waiohuli
Homestead Community Final Environmental Assessment
/Finding of No Significant Impact (FONSI)

Thank you for your letter dated June 23, 2005 (your
reference HRD05/1503B). We offer the following responses to
your comments.

1. Please be assured that efforts are underway to protect archaeological resources within the project site. In addition to the inventory survey and data recovery plan completed and accepted by the State Historic Preservation Division (SHPD), data recovery fieldwork is ongoing and a preservation plan, a burial treatment plan, and a monitoring plan will be prepared and submitted to the SHPD prior to any ground-altering activity.
2. Despite the best efforts of the engineers to design the roadways to avoid disturbing any known burials, it appears necessary to move one burial a few meters. We shall consult with the Maui Island Burial Council, Office of Hawaiian Affairs, and community associations before taking any actions.
3. All ground-altering activities will be monitored by a professional archaeologist. Pre-contact historic properties will not be destroyed unless absolutely necessary to accommodate housing for DHHL beneficiaries.

Clyde W. Namuo, Administrator
July 27, 2005
Page 2

4. Although DHHL will not provide landscaping for the Waiohuli Homestead Community, native plants (particularly Awikiwiki, Kooloauala, Iliana, and Mao Hau Hele) will be suggested for use by residents.

5. Should iwi or Native Hawaiian cultural or traditional deposits be found during ground disturbance, work will cease and the appropriate agencies will be contacted.

Thank you again for your participation in the Environmental Assessment process. If you have any questions regarding this project, please call Darrell Ing of our Land Development Division at 586-3844.

c: Anson Murayama, Community Planning and Engineering, Inc.
Lacey Kazama, PBR HAWAII

ALAN M. ARAKAWA
Mayor



DEPARTMENT OF PARKS & RECREATION
700 Hali'a Nakoa Street, Unit 2, Wailuku, Hawaii 96793

GLEN T. CORREA
Director

JOHN L. BUCK III
Deputy Director

(808) 270-7230
Fax (808) 270-7934

DEPARTMENT OF PARKS & RECREATION

700 Hali'a Nakoa Street, Unit 2, Wailuku, Hawaii 96793

July 1, 2005

Lacey Kazama
PBR Hawaii
ASB Tower, Suite 650
1001 Bishop Street
Honolulu, Hawaii 96813-3484

RE: Waiohuli Homestead Community - Draft Environmental Assessment
TMK: (2) 2-2-002:014 por & 055 por

Dear Ms. Kazama:

Thank you for the opportunity to review the Draft Environmental Assessment (EA) for the Waiohuli Homestead Community project.

The Kula area is currently deficient in active fields for the existing population of approximately 7,200. Only Keokea Park with one multi-purpose field for soccer and baseball, and Kula Recreational Center with two multi-purpose fields for soccer and baseball serve the community.

The total number of all residential lots listed in the Draft EA, including Kula Residential Lots - Unit 1 & Unit 2 (also referred to as Waiohuli Subdivision), Keokea Agricultural Lots - Unit 1, and the Waiohuli Homestead Community, is approximately eight hundred twenty-six (826). Using present population projection ratios per residential unit, the 826 residential lots will generate a population of between 2,200 and 2,500. Based on our departmental standards for recreational facilities, the proposed development would generate a demand for two tennis courts, three sport courts, and one large multi-purpose field. An area of approximately ten acres with 5% slope would accommodate this requirement.

Although, as stated in the Draft EA, this project is exempt from the Maui County Code (MCC) regarding Park Dedication Requirements, we strongly urge that, at the least, the recreational needs of the residents be provided for with the construction of the aforementioned improvements in conjunction with the development.

Lacey Kazama
Waiohuli Homestead Community

July 1, 2005
Page 2

Thank you for the opportunity to provide these comments. Should you have any questions or need of additional information or clarification, please contact me or Patrick Matsui, Chief of Parks Planning & Development at 808-270-7387.

Sincerely,

Glen T. Correa
Director

c: Genevieve Salmonson, Office of Environmental Quality Control
Darrell Ing, Department of Hawaiian Home Lands
Patrick Matsui, Chief of Parks Planning & Development

LINDA LINGLE
GOVERNOR
STATE OF HAWAII



STATE OF HAWAII
DEPARTMENT OF HAWAIIAN HOME LANDS

P.O. BOX 1879
HONOLULU, HAWAII 96805

MICAH A. KANE
CHAIRMAN
HAWAIIAN HOMES COMMISSION
BEN HENDERSON
DEPUTY TO THE CHAIRMAN
KAULANA H. PARK
EXECUTIVE ASSISTANT

Mr. Glenn T. Correa, Director
July 27, 2005
Page 2

Assessment process. If you have any questions regarding this project, please call Darrell Ing of our Land Development Division at 586-3844.

Aloha and mahalo,

MICK

Micah A. Kane, Chairman
Hawaiian Homes Commission

Mr. Glenn T. Correa, Director
County of Maui
Department of Parks and Recreation
700 Halia Nakoa Street, Unit 2
Wailuku, Maui, Hawaii 96793

Dear Mr. Correa:

SUBJECT: Department of Hawaiian Home Lands (DHHL) Waiohuli
Homestead Community Final Environmental Assessment
/Finding of No Significant Impact (FONSI)

Thank you for your letter dated July 1, 2005. We offer the following responses to your comments.

We understand that the Kula area is currently deficient in active fields for the existing population. Only Keokea Park with one multi-purpose field for soccer and baseball, and Kula Recreational Center with two multi-purpose fields for soccer and baseball currently serve the community.

We acknowledge your calculation that DHHL homestead lots in the Waiohuli-Keokea area would generate a population of between 2,200 and 2,500 people and a corresponding demand for two tennis courts, three sport courts, and one large multi-purpose field. We further acknowledge your statement that an area of approximately ten acres with five percent slope would accommodate this requirement. As noted in the Draft Environmental Assessment, while the development of Hawaiian home lands is exempt from the Maui County Code regarding Park Dedication Requirements, DHHL has designated a 2.5-acre parcel for development of a park in the Kula Residential Lots subdivision.

Thank you again for your participation in the Environmental

c: Anson Murayama, Community Planning and Engineering, Inc.
Lacey Kazama, PBR HAWAII

ALAN M. ARAKAWA
Mayor
MICHAEL W. FOLEY
Director
WAYNE A. BOTEILHO
Deputy Director



COUNTY OF MAUI
DEPARTMENT OF PLANNING

July 7, 2005

Ms. Lacey Kazama
PBR Hawaii
ASB Tower, Suite 650
1001 Bishop Street
Honolulu, Hawaii 96813

Dear Ms. Kazama:

RE: Draft Environmental Assessment for the Proposed Waiohuli Homestead Community, Department of Hawaiian Home Lands, located at TMK: 2-2-002: 014 (portion) and 055 (portion), Waiohuli, Upcountry, Island of Maui, Hawaii (LTR 2005/1591)

The Maui Planning Department (Department) has reviewed the Draft Environmental Assessment (EA) prepared for the proposed Waiohuli Homestead Community consisting of approximately 337 single-family residential units and related improvements. The Department provides the following comments:

1. Section 2.0, Description of the Project
 - a. Identify the responsible entity for the construction of the homes.
 - b. Discuss restrictions, if any, on ohana units or second dwellings for each lot. If ohana units are allowed on the proposed lots, provide an analysis of potential impacts and mitigative measures resulting from the increase in density.
 - c. What is the expected cost of improvements?
2. Section 3.2.1, Maui County General Plan
 - a. In reference to the Public Utilities and Infrastructure, the Draft EA notes that a public school site is proposed within the DHHL

Ms. Lacey Kazama
July 7, 2005
Page 2

Keokea/Waiohuli tract. Please provide further information and discussion to include, but not be limited to, the proposed grade levels, anticipated date of construction, anticipated location, etc.

3. Section 3.3, Approvals and Permits
 - a. The responsible agency for Chapter 343, HRS, should be DHHL.
 - b. Please provide a list of permit/approvals as sited throughout the Draft EA for which the proposed project is exempt.
4. Section 4.8, Flora
The Draft EA indicates existing plant populations found within the 196-acre developed portion of the site will be removed by construction activities. Discuss alternatives to mitigate impacts to existing colonies, such as but not limited to, transplanting, preservation, etc.
5. Section 6.1, Transportation Facilities
 - a. The Draft EA indicates that three (3) projects in the Pukalani area were reviewed to determine the additional traffic generated in the study area. In addition to those three (3), the Department is aware of the following proposed projects which will also add traffic to the study area and should be included in the background traffic conditions:
 - i. Kauhale Lani Subdivision, TMK: 2-3-009: 007 and TMK: 2-3-009: 064, 165 new single family homes;
 - ii. Hanohano Subdivision, TMK: 2-3-011: 001 and 002, proposed 49 lot single family subdivision; and
 - iii. Makaena Place Subdivision, TMK: 2-3-032: 005-008, 010-012, 014-016, proposed redistricting for potential of 39 lot single family subdivision.
 - b. The TIAR recommends mitigating traffic impacts by improving the Lau'ie Drive at Kula Highway intersection with a separate left-turn lane from Kula Highway into the project area and a

refuge lane for traffic turning left from the project area to Kula Highway. The Draft EA indicates that the improvements may not be necessary until the project is in the later stages of development and that the intersection should be monitored to determine when the improvements should be implemented.

Identify the agency responsible for monitoring the intersection. Discuss the standards that will be used to determine when the improvements will be implemented.

6. Section 6.2, Water Supply Facilities

The Draft EA indicates the residents of Waiohuli Homestead Community will be limited to the 600 gallons per unit allotment, per DWS. Discuss how this will be monitored and enforced. Discuss the potential impacts should the community exceed the allotment.

7. Section 6.3, Wastewater Facilities

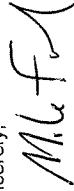
Identify whether any potable drinking water wells are located in the vicinity of the project area.

8. A site plan and proposed or conceptual subdivision plan for the area should have been included in the Draft EA for a more thorough analysis.

9. Discuss how the proposed development addresses the objectives of the Upcountry Greenway Masterplan, November 2003.

Thank you for the opportunity to comment. Should you require further clarification, please contact Ms. Kivette Caigoy, Environmental Planner, at 270-7735.

Sincerely,



MICHAEL W. FOLEY
Planning Director

MWF:KAC:lar

c: Wayne Boteilho, Deputy Planning Director
Clayton Yoshida, AICP, Planning Program Administrator
Kivette Caigoy, Environmental Planner
TMK File
General File
K:\WP_DOCS\PLANNING\EA\DEA\Comments\2005\1591_WaiohuliHomesteadComm.wpd



STATE OF HAWAII
DEPARTMENT OF HAWAIIAN HOME LANDS

P.O. BOX 1879
HONOLULU, HAWAII 96805

MICHAEL A. KANE
COUNTY OF MAUI
HAWAIIAN HOME COMMISSION
BEN HENDERSON
DEPUTY TO THE CHAIRMAN
KAILANA B. PARK
EXECUTIVE ASSISTANT

August 5, 2005

Mr. Michael W. Foley, Planning Director
County of Maui
Department of Planning
200 South High Street
Wailuku, Maui, Hawaii 96793

Attn: Ms. Kivette Caigoy

Dear Mr. Foley:

SUBJECT: Department of Hawaiian Home Lands (DHHL) Waiohuli
Homestead Community Final Environmental Assessment
/Finding of No Significant Impact (FONSI)

Thank you for your letter dated July 7, 2005. We offer the following responses to your comments.

1. a. Individual awardees will be responsible for construction of the Waiohuli Homestead Community homes.
b. Ohana units or second dwellings on each lot will not be allowed.
c. The estimated cost of improvements is \$55 million.
2. The DHHL Maui Island Plan (September 2004) designated 30 acres within the Keokea/Waiohuli tract for an elementary and/or intermediate school. The location, size of the facility, grade levels, and development schedule have not yet been determined.
3. a. Thank you for confirming that the responsible agency for the Chapter 343, HRS compliance is the DHHL.
b. A list of permits/approvals for which this project is exempt will be included in the Final EA.

Mr. Michael W. Foley, Planning Director
August 5, 2005
Page 2

4. The Final EA will clarify that plants to be removed by construction activities for the proposed Waiohuli Homestead Community are introduced and evasive species such as the evasive lantana (*Lantana camara*), black wattle (*Acacia decurans*), Christmas Berry (*Schinus terebinthifolius*), panini or prickly pear cactus (*Opuntia megacantha*), and various grasses and secondary growth shrubs. The three endangered plant species and one candidate endangered plant species identified by the Hawaii Natural Heritage Program were found west of the 523-acre site within the Pu'u-o-kali cinder cone and a 236-acre native Hawaiian ecosystem and will not be disturbed by construction of the proposed project.

5. a. The TIAR assessed the traffic impacts of three projects in Pukalani (Upcountry Town Center, Kanehameha School and Kulamalu, and Kauhale Lani), but did not include the Hanohano Subdivision or the Makaena Place Subdivision. According to the TIAR, the Kauhale Lani Subdivision, with 165 single-family homes, would generate a total of 137 trips (inbound and outbound) in the AM peak hour and 168 trips in the PM peak hour. We understand that this project has recently been sold and we are presently unsure if this project may be significantly revised.

The Hanohano Subdivision and Makaena Place Subdivision would include a total of 88 single-family lots. Combined, these subdivisions are likely to generate about half as many trips as the Kauhale Lani Subdivision (which proposes about twice as many single-family homes) during the AM and PM peak hours.

Additionally, the Upcountry Town Center project, which the TIAR estimated to generate 486 trips in the AM peak hour and 1,017 trips in the PM peak hour, has been cancelled by Maui Land & Pineapple. The Upcountry Town Center would have generated a significantly greater number of trips in both the AM and PM peak hours than the Hanohano Subdivision and the Makaena Place Subdivision, and as such, the TIAR overestimated future traffic in the study area.

The TIAR also presented overestimated future traffic by conservatively assuming that once the subdivision

Mr. Michael W. Foley, Planning Director
August 5, 2005
Page 3

improvements for the Waiohuli Community were completed, awarees of the various lots would immediately build and occupy their respective lots - historically, this has not been the case.

- b. Regarding future improvements at the intersection of Laue Drive and Kula Highway, the Police Department may be the appropriate agency to be tasked with monitoring the intersection and determining when a separate left-turn lane from Kula Highway into the project area and a refuge lane for traffic turning left from the project area to Kula Highway should be implemented. In the case of the Police Department, their professional experience will be the "standards" that will be used to determine when the improvements should be implemented.

6. The Draft EA erroneously stated that residents would be limited to 600 gallons per day (gpd), per unit. That amount is the standard used by the Maui Department of Water Supply (DWS) for planning purposes. The DWS has committed 500,000 gallons of water per average day to the Kula, Keokea, and Waiohuli DPHL developments. The DPHL has asked the DWS to monitor the usage of water against the 500,000 gpd for the developments, rather than the 600 gpd for each lot. Some homes may use more than the 600 gpd, while others will use less. The DPHL has further requested that in the event the committed amount of 500,000 gallons of water per average day is exceeded by the developments as a whole, the DWS notify the DPHL. In this notification, the DWS would list any homes that consistently use more than the average of 600 gallons per average day. The DPHL would then send a letter to those homes reminding the lessees that water should be conserved and that each home should not be using more than an average of 600 gpd.

7. We are not aware of any potable drinking water wells in the vicinity of the project area. This will be so stated in the Final EA.

8. Please refer to Figure 3 of the Draft EA for a conceptual subdivision plan for the project. The Final EA will include the same figure.

9. The project site is within the Kula-Ulupalakua study area

Mr. Michael W. Foley, Planning Director
August 5, 2005
Page 4

of the Upcountry Greenway Masterplan (Draft), April 2003. Our copy of this masterplan is in black and white and a little unclear but it shows that either a "Near-Term Off-Road Route" or a "Near-Term Route Within or Adjacent to Right-of-way" will be pass the project site along Kula Highway. No priority routes have been selected for this region, and the project does not conflict with the goal or objectives of the master plan.

Thank you again for your participation in the Environmental Assessment process. If you have any questions regarding this project, please call Darrell Ing of our Land Development Division at 586-3844.

Aloha and mahalo,



Micah A. Kane, Chairman
Hawaiian Homes Commission

c: Anson Murayama, Community Planning and Engineering, Inc.
Lacey Kazama, PBR HAWAII

ALAN M. ARAKAWA
Mayor

MILTON M. ARAKAWA, A.I.C.P.
Director

MICHAEL M. MIYAMOTO
Deputy Director

Telephone: (808) 270-7845
Fax: (808) 270-7955



COUNTY OF MAUI
**DEPARTMENT OF PUBLIC WORKS
AND ENVIRONMENTAL MANAGEMENT**
200 SOUTH HIGH STREET, ROOM 322
WAILUKU, MAUI, HAWAII 96793

RALPH NAGAMINE, L.S., P.E.
Development Services Administration

TRACY TAKAMINE, P.E.
Wastewater Reclamation Division

CARY YAMASHITA, P.E.
Engineering Division

BRIAN HASHIRO, P.E.
Highways Division

Solid Waste Division

July 8, 2005

Ms. Lacey Kazama
PBR HAWAII
1001 Bishop Street
ASB Tower, Suite 650
Honolulu, Hawaii 96813

Dear Ms. Kazama:

SUBJECT: DRAFT ENVIRONMENTAL ASSESSMENT
WAOHULI HOMESTEAD COMMUNITY
TMK: (2) 2-2-002:014

We reviewed the subject application and have the following comments:

1. Submit solid waste/recycling plan for review and approval.
2. We would recommend that the drainage facilities and street-lighting facilities remain under the Department of Hawaiian Home Lands (DHHL) ownership and maintenance.
3. A 30 foot radius shall be provided at the intersection of the proposed subdivision road/driveway and the adjoining subdivision roads and State roads.
4. A verification shall be provided by a Registered Civil Engineer that the grading and runoff water generated by the project will not have an adverse effect on the adjacent and downstream properties.
5. The preliminary drainage report is inadequate. The report does not adequately address impacts to adjoining and downstream areas. The report also seems to indicate that they are assuming that there will be no increase in runoff after development of the Keokea area.


Ms. Lacey Kazama
July 8, 2005
Page 2

This is not in accordance with County drainage standards. The report must be revised to more clearly address impacts and must indicate how these impacts will be mitigated.

6. A detailed and final drainage report and a Best Management Practices (BMP) Plan shall be submitted with the grading plans for review and approval prior to issuance of grading permits. The drainage report shall include hydrologic and hydraulic calculations and the schemes for disposal of runoff waters. It must comply with the provisions of the "Rules and Design of Storm Drainage Facilities in the County of Maui" and must provide verification that the grading and runoff water generated by the project will not have an adverse effect on adjacent and downstream properties. The BMP plan shall show the location and details of structural and non-structural measures to control erosion and sedimentation to the maximum extent practicable.
7. All existing features such as structures, driveways, drainage ways, edge of the pavement, etc. shall be shown on the project plat plan.
8. A site plan and a sight distance report to determine required sight distance and available sight distance at existing and proposed street intersections shall be provided for our review and approval.
9. The existing streets providing access to the subdivision shall have a 20 foot minimum pavement width.
10. A detailed final Traffic Impact Assessment Report for the entire subdivision/development shall be submitted for our review and approval. The report shall also address regional traffic impacts and include assessments from the local community police officer.

Please call Michael Miyamoto at (808) 270-7845 if you have any questions regarding this letter.

Sincerely,


MILTON M. ARAKAWA, A.I.C.P.
Director

MMA:MMM:da
xc: Office of Environmental Quality Control
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STATE OF HAWAII
DEPARTMENT OF HAWAIIAN HOME LANDS

P.O. BOX 1879
HONOLULU, HAWAII 96805

August 5, 2005

Mr. Milton M. Arakawa, AICP, Director
County of Maui
Department of Public Works and Environmental Management
200 South High Street, Room 322
Wailuku, Maui, Hawaii 96793

Attn: Mr. Michael Miyamoto

Dear Mr. Arakawa:

SUBJECT: Department of Hawaiian Home Lands (DHHL) Waiohuli
Homestead Community Final Environmental Assessment
/Finding of No Significant Impact (FONSI)

Thank you for your letter dated July 8, 2005. We offer the following responses to your comments.

1. A solid waste/recycling plan will be developed and submitted for review and approval.
2. Drainage facilities within roadways shall be licensed to the County for maintenance purposes. Street-lighting facilities will be energized by the DHHL and licensed to and maintained by Maui Electric Company.
3. A 30-foot radius will be provided at the intersection of the proposed subdivision roads and the adjoining subdivision roads and State roads.
4. A registered civil engineer will verify that the grading and runoff water generated by the project will not have an adverse impact on the adjacent and downstream properties.
5. The preliminary drainage report will be revised to more clearly address impacts to adjoining and downstream areas and indicate how these impacts will be mitigated.
6. The final drainage report and Best Management Practices (BMP) Plan will be submitted with grading plans for review and approval prior to the issuance of grading permits.

MICAH A. KANE
CHAIRMAN
HAWAIIAN HOMES COMMISSION
BEN HENDERSON
DEPUTY TO THE CHAIRMAN
KAULANA H. PARK
EXECUTIVE ASSISTANT

Mr. Milton M. Arakawa, AICP, Director
August 5, 2005
Page 2

The drainage report will include hydrologic and hydraulic calculations and the schemes for disposal of runoff waters. It will comply with the provisions of the "Rules and Design of Storm Drainage Facilities in the County of Maui" and will provide verification that the grading and runoff water generated by the project will not have an adverse effect on adjacent and downstream properties. The BMP Plan will show the location and details of structural and non-structural measures to control erosion and sedimentation to the maximum extent practicable.

7. All existing features such as structures, driveways, drainageways, edge of the pavement, etc. will be shown on the project plat plan.
8. A site plan and a sight distance report to determine required sight distance and available sight distance at existing and proposed street intersections shall be provided for review and approval.
9. The existing streets providing access to the subdivision shall have a 20-foot minimum pavement width.
10. The TIAR for the project addressed regional traffic impacts and was included as Appendix C of the Draft EA. It will also be included in the Final EA. During the public review period, the Police Department wrote and provided an assessment of traffic in the area (see attachment). A copy of the Final EA will be sent to your Department.

Thank you again for your participation in the Environmental Assessment process. If you have any questions regarding this project, please call Darrell Ing of our Land Development Division at 586-3844.

Aloha and mahalo,

Micah A. Kane, Chairman
Hawaiian Homes Commission

Enclosure: Letter from the Police Department

c: Anson Murayama, Community Planning and Engineering, Inc.
Lacey Kazama, PBR HAWAII



ALAN M. ARAKAWA
MAYOR

OUR REFERENCE
YOUR REFERENCE

POLICE DEPARTMENT COUNTY OF MAUI

55 MAHALANI STREET
WAILUKU, HAWAII 96793
(808) 244-6400
FAX (808) 244-6411

June 16, 2005



THOMAS M. PHILLIPS
CHIEF OF POLICE
KEKUAUPIO R. AKANA
DEPUTY CHIEF OF POLICE

Ms. Lacey Kazama
PBR Hawaii
1001 Bishop Street
ASB Tower, Suite 650
Honolulu, HI 96813

Dear Ms. Kazama:

SUBJECT: Waiohuli Homestead Community
TMK: 2-2-002: 014 (portion) and 055 (portion)

Thank you for your letter of June 2, 2005, requesting comments on the above subject.

We have reviewed the Draft Environmental Assessment (EA) and have enclosed our comments and recommendations. Thank you for giving us the opportunity to comment on the proposed project.

Very truly yours,

Glenn Miyahira
Acting Assistant Chief
for: Thomas M. Phillips
Chief of Police

Enclosure

c: Michael Foley, Maui County Planning Department
Office of Environmental Quality Control

COPY

Transmit to
PBR Hawaii
legally
10/16/05

TO : THOMAS PHILLIPS, CHIEF OF POLICE, COUNTY OF MAUI
VIA : GEORGE FONTAINE, CAPTAIN, WAILUKU PATROL
FROM : MITCHELL PELLAZAR, SERGEANT, WAILUKU PATROL
SUBJECT : WAIHULI HOMESTEAD COMMUNITY
TMK: 2-2-002: 014 & 055

This To-From is being submitted in regards to comments on the above-named sub-division Draft Environmental Assessment.

Comments:

1. Traffic onto Kula Highway may not be affected significantly in the area of Kula Residential Lot at this time with the development of the Waiohuli Homestead Community, but future development in the Keokea area, could require the widening of Kula Highway in the area of the Kula Residential Lots entrances.
2. With the estimated 337-new residential units planned for the Waiohuli Homestead Community, even with the listed private schools in the Upcountry area, it is anticipated that a majority of the students will attend public schools, Kula Elementary, Kalama Intermediate and King Kekaulike High School which will increase traffic congestion in these areas and will affect the AM and PM peak traffic flow for Kula Elementary School, the entrance to Kamehameha Schools and the Kulamalu Sub-division and King Kekaulike High School. This will also affect the overall traffic level of service on the intersection at Haleakala Highway/Kula Highway commonly referred to as "5-trees".
3. At this time due to Maui Land and Pineapple cancelling the proposed project for the Upcountry Town Center, traffic on Makawao Avenue at the Old Haleakala Highway and Haleakala Highway By-pass intersections should not be affected significantly. However it is anticipated that ML&P will develop this property in the future.
4. Roadway lanes within the Waiohuli Homestead Community should be wide enough and adequate turn radius to accommodate the larger Fire Department equipment currently in service.
5. Regarding Police Service: To clarify on the submitted DEA on page 67 (5.8) The Upcountry area is served by Officers dispatched out of the Main Police headquarters in Wailuku. The Police Upcountry area includes: Pukalani, Makawao, Kula, Paia and Haiku. Due to promotions and retirements, the Kula Community Officer position, has not been filled since 2001, and the office at the

ALAN M. ARAKAWA
Mayor



GEORGE Y. TENGAN
Director
JEFFREY T. PEARSON, P.E.
Deputy Director

DEPARTMENT OF WATER SUPPLY

COUNTY OF MAUI
200 SOUTH HIGH STREET
WAILUKU, MAUI, HAWAII 96793-2155
www.mauewater.org

Kula Community Center is not staffed by an officer on a regular basis, thus response time to the project area or any outlying areas in the Keokea / Ulupalakua areas for any emergency will be delayed. Though aggressive measures are being taken by the Police Department to fill all vacancies, it is unknown when the Kula Community Police Officer position will be staffed.

6. Kula Highway in the area of the Kula Residential Lots should be planned to accommodate road widening projects in the future, as it appears at this time to have sufficient sight-distance for vehicle safety. However shoulder improvements would need to be made for roadway widening.

The comments submitted are suggestions regarding this Draft Environmental Assessment.

Submitted for your information.

Sgt. Mitchell

Sgt. Mitchell Pellazar E-8468
Wailuku Patrol - Administrative Sergeant
06/15/05 - 1330 hours

car 2007
6/16/07

July 1, 2005

Ms. Lacey Kazama
PBR Hawaii
ASB Tower, Suite 650
1001 Bishop Street
Honolulu, Hawaii 96813

Subject: Waiohuli Homestead Community Draft Environmental Assessment

Dear Ms. Kazama:

Thank you for the opportunity to comment on this Draft Environmental Assessment.

Source Availability & Consumption

The project site is served by the Upcountry/Makawao System. Water for the system comes from the Makawao Aquifer and streams of the Koolau System.

Anticipated consumption for the proposed project would be approximately 202,200 gpd by system standards.

The project is located in an area affected the finding of inadequate water supply issued on March 16, 1993. Although the area has insufficient water supply developed for fire protection, domestic and irrigation purposes to take on new or additional services without the detriment to those existing in the area, DHHL has met its source requirement.

The Department has a Water Credits Agreement, signed on December 9, 1997, with the DHHL. The agreement states that the Department shall commit 500,000 gpd to DHHL, except during drought periods. Accordingly, the number of single family units is limited by the amount of water available under this agreement.

System Infrastructure

There is a 8-inch waterline in proximity to the project site along Lauie Drive. Storage is provided by a 2 MG Kula Kai Tank. The project will be subject to Department rules and regulations for subdivisions. The applicant and its lessees will be required to meet standards for domestic,

"By Water All Things Find Life"

Ms. Lacey Kazama
Page 2
July 1, 2005

irrigation and fire flow calculations. The approved fire flow calculation methods for use include Guidance for Determination of Fire Flow-Insurance Service Office, 1974 and Fire Flow-Hawaii Bureau, 1991. The fire flow requirement for single family units is 1000 gallons per minute at 350 feet spacing for a 2 hour duration.

Pollution

The project overlies the Makawao aquifer which has a sustainable yield of 7 MGD. In order to protect the groundwater resources, we encourage the applicant to adapt best management practices (BMPs) for construction to minimize infiltration and runoff. Please refer to the BMP "Source Water Protection Practices Bulletin - Managing Storm Water Runoff to Prevent Contamination of Drinking Water".

Conservation

We recommend that the applicant and its lessees consider the following conservation measures:

Eliminate Single-Pass Cooling:

Single-pass water cooled systems should be eliminated per Maui County Code Subsection 14.21.20. Although prohibited by code, single-pass water cooling is still manufactured into some models of air conditioners, freezers and commercial refrigerators.

Utilize Low-Flow Fixtures and Devices:

Maui County Code Subsection 16.20A.680 requires the use of low-flow fixtures and devices in faucets, showerheads, urinals, water closets and hose bibs. Water conserving washing machines, ice-makers and other devices are available.

Maintain Fixtures to Prevent Leaks:

A simple, regular program of repair and maintenance can prevent the loss of hundreds or even thousands of gallons of water per day. Refer to attached handout "The Costly Drip".

Use Climate-Adapted Plants:

The project site is located in the "Maui County Planting Plan" - Plant Zone 2. Native plants adapted to the area conserve water and protect the watershed from degradation due to invasive alien species. Please refer to the attached brochure "Saving Water in the Yard - What and How to Plant in Your Area".

Prevent Over-Watering by Automated Systems:

Provide rain-sensors on all automated irrigation controllers. Check and reset controllers at least once a month to reflect the monthly changes in evaporation rates at the site. As an alternative, provide more automated, soil-moisture sensors on controllers.

Ms. Lacey Kazama
Page 3
July 1, 2005

Should you have any questions, please contact me at 270-7816.

Sincerely,



George Y. Tongan, Director
ayi

Enclosures: Source Water Protection Bulletin - Managing Storm Water Runoff to Prevent Contamination of Drinking Water
Ordinance No. 2108 - A Bill for an Ordinance Amending Chapter 16.20 of the County of Maui Code, Pertaining to the Plumbing Code
The Costly Drip

Maui County Planting Plan - Saving Water in the Yard - What and How to Plant in Your Area

c: Engineering
Office of Environmental Quality Control
Department of Hawaiian Home Lands



United States
Environmental Protection
Agency

Office of Water
(4606)

EPA 816-F-01-020
July 2001

Source Water Protection Practices Bulletin

Managing Storm Water Runoff to Prevent Contamination of Drinking Water

Storm water runoff is rain or snow melt that flows off the land, from streets, roof tops, and lawns. The runoff carries sediment and contaminants with it to a surface water body or infiltrates through the soil to ground water. This fact sheet focuses on the management of runoff in urban environments; other fact sheets address management measures for other specific sources, such as pesticides, animal feeding operations, and vehicle washing.

SOURCES OF STORM WATER RUNOFF

Urban and suburban areas are predominated by impervious cover including pavements on roads, sidewalks, and parking lots; rooftops of buildings and other structures; and impaired pervious surfaces (compacted soils) such as dirt parking lots, walking paths, baseball fields and suburban lawns.

During storms, rainwater flows across these impervious surfaces, mobilizing contaminants, and transporting them to water bodies. All of the activities that take place in urban and suburban areas contribute to the pollutant load of storm water runoff. Oil, gasoline, and automotive fluids drip from vehicles onto roads and parking lots. Storm water runoff from shopping malls and retail centers also contains hydrocarbons from automobiles.

Landscaping by homeowners, around businesses, and on public grounds contributes sediments, pesticides, fertilizers, and nutrients to runoff. Construction of roads and buildings is another large contributor of sediment loads to waterways. In addition, any uncovered materials such as improperly stored hazardous substances (e.g., household cleaners, pool chemicals, or lawn care products), pet and wildlife wastes, and litter can be carried in runoff to streams or ground water. Illicit discharges to storm drains (e.g., used motor oil), can also contaminate water supplies.

Storm water is also directly injected to the subsurface through Class V storm water drainage wells. These wells are used throughout the country to divert storm water runoff from roads, roofs, and paved surfaces. Direct injection is of particular concern in commercial and light industrial settings (e.g., in and around material loading areas, vehicle service areas, or parking lots).



Parking lot runoff

WHY IS IT IMPORTANT TO MANAGE STORM WATER RUNOFF NEAR THE SOURCES OF YOUR DRINKING WATER?

Impervious areas prohibit the natural infiltration of rainfall through the soil, which could filter some contaminants before they reach ground water. Also, impervious surfaces allow the surface runoff to move rapidly. Development reduces the amount of land available for vegetation, which can mitigate the effects of rapid runoff and filter contaminants. When the percentage of impervious cover reaches 10 to 20 percent of a watershed area, degraded water quality becomes apparent.

There are three primary concerns associated with uncontrolled runoff: (1) increased peak discharge and velocity during storm events resulting in flooding and erosion; (2) localized reduction in recharge; and (3) pollutant transport.

When runoff is confined to narrow spaces, such as streets, the velocity at which water flows increases greatly with depth. This contributes to erosion in areas without vegetation cover, increased flooding in low lying areas, and sedimentation in surface water bodies. Sediment deposited in streams can increase turbidity, provide transport media for pathogenic bacteria and viruses, and decrease reservoir capacity. Sediments also smother aquatic species, leading to habitat loss and decreased biodiversity of aquatic species. The fast-running runoff is not afforded an opportunity to infiltrate into the subsurface, and ground waters are not recharged by rain events.



Erosion

EPA considers nonpoint source pollution, including storm water runoff, to be one of the most important sources of contamination of the nation's waters. According to a nationwide study, 77 of 127 priority pollutants tested were detected in urban runoff. Some of the principal contaminants found in storm water runoff include heavy metals, toxic chemicals, organic compounds, pesticides and herbicides, pathogens, nutrients, sediments, and salts and other de-icing compounds. Some of these substances are carcinogenic; others lead to reproductive, developmental, or other health problems that are associated with long-term exposure. Pathogens can cause illness, even from short-term exposure, that can be fatal to some people.



Urban runoff

AVAILABLE PREVENTION MEASURES TO ADDRESS STORM WATER RUNOFF

A variety of management practices, including pollution prevention and treatment devices, are available to abate storm water pollution. The most effective storm water pollution prevention plans combine these measures and reflect local soil, precipitation, and land use conditions. Some of the more widely-used management measures are described below.

Please keep in mind that individual prevention measures may or may not be adequate to prevent contamination of source waters. Most likely, individual measures should be combined in an overall prevention approach that considers the nature of the potential source of contamination, the purpose, cost, operational, and maintenance requirements of the measures, the vulnerability of the source waters, the public's acceptance of the measures, and the community's desired degree of risk reduction.

Pollution source control and prevention measures include public education to homeowners and business owners on good housekeeping, proper use and storage of household toxic materials, and responsible lawn care and landscaping; storm drain stenciling; hazardous materials collection; and eliminating illicit discharges. The incorporation of best management practices (BMPs) in building and site-development codes, if feasible, should be encouraged. On roadways, proper maintenance of rights-of-way, control of chemical and nutrient applications, street cleaning or sweeping, storm drain cleaning, use of alternative or reduced de-icing products, and equipment washing can reduce the pollutant content of runoff.

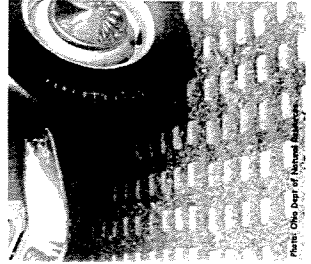
Without appropriate *erosion and sedimentation control (ESC) measures*, construction activities can contribute large amounts of sediment to storm water runoff. Erosion can be controlled by planting temporary fast-growing vegetation, such as grasses and wild flowers. Covering top soil with geotextiles or impervious covers will also protect it from rainfall. Good housekeeping measures for construction sites include construction entrance pads and vehicle washing to keep sediment and soil on-site. Construction should be staged to reduce soil exposure, or timed to coincide with periods of low rainfall and low erosion potential, such as in the fall, rather than during spring rains. Other measures include sediment traps and basins; sediment fences; wind erosion controls; and sediment, chemical, and nutrient control.

If available, ordinances and regulations on construction activities can require plan reviews to ensure that erosion during construction is minimized or require ESC measures during construction. Inspections of ESC measures and repair of controls where needed will maintain the working order of these controls and maximize their benefit.

Local governments can use a variety of *land use controls* to protect source water from potential contamination. For example, subdivision controls help to ensure that expected development will not compromise drinking water quality or ground water recharge. Requiring proper storm water management in new developments and redevelopments will ensure that runoff does not become excessive as areas of paved surfaces increase. *Low impact development* incorporates maintaining pre-development hydrology, considering infiltration technology, and re-routing water to recharge the aquifer.

Minimizing directly connected impervious areas (DCIAs) is important to reducing the flow and volume of runoff. Planners should direct runoff from roofs, sidewalks, and other surfaces over grassed areas to promote infiltration and filtration of pollutants prior to surface water deposition. Porous design of parking lots also provides places for storm water to infiltrate to soils. *Concrete grid pavement* is typically placed on a sand or gravel base with void areas filled with pervious materials such as sand, gravel, or grass. Storm water percolates through the voids into the subsoil. Planting landscaped areas lower than the street level encourages drainage.

Structural designs are used to control runoff or temporarily store storm water on site. A number of structural devices have been developed to encourage filtration, infiltration, or settling of suspended particles. Some of the more commonly-used practices are described below.

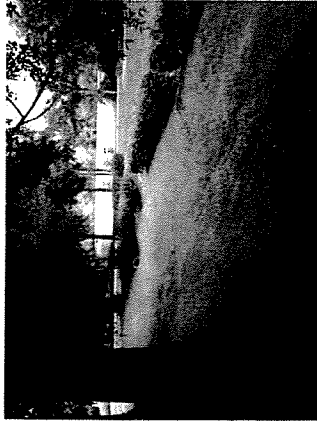


Concrete grid pavement

Grassed swales are shallow, vegetated ditches that reduce the speed and volume of runoff. Soils remove contaminants by infiltration and filtration. Vegetation, or turf, prevents soil erosion, filters out sediment, and provides some nutrient uptake. Maintenance of grassed swales involves regular mowing, re-seeding, and weed control, along with inspections to check for erosion and ensure the integrity of the vegetative cover. To function properly, the inflow to the swale must be sheet flow from a filter strip or an impervious surface (i.e., not from the end of a pipe). Swales have demonstrated solids removals exceeding 80 percent. Apart from grassed swales, *grassed waterways* (wide, shallow channels lined with sod) are often used as outlets for runoff from terraces.

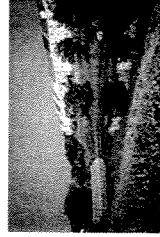
Buffer strips are combinations of trees, shrubs, and grasses planted parallel to a stream. Buffer strips should consist of three zones—about four or five rows of trees closest to the stream, one or two rows of shrubs, and a 20 to 24 foot wide grass zone on the outer edge. They decrease the velocity of runoff, thus moderating flooding and preventing stream bank erosion. The vegetation and soils also strain and filter sediments and chemicals. Buffer strips should be maintained by controlling weeds and mowing grasses once or twice annually. In the long term, each zone should be harvested and replanted. About 10 to 20 percent removal of solids has been demonstrated in buffer zones. These buffer strips, however, do not necessarily increase infiltration.

Filter strips are areas of close-growing vegetation on gently sloped land surfaces bordering a surface water body. They work by holding soils in place, allowing some infiltration, and filtering solid particles out of the runoff from small storms. Plants with dense root systems are preferred; the ideal species and mixes of vegetation are specific to the region. The width and length of the filter strip depends on the size and grade of the slope it drains. Maintenance activities include inspections, mowing, and removal of sediment build-up. Filter strips can remove nitrogen and phosphorus, but are less effective in filtering pesticides. They are most effective when water flow is even and shallow and if grass can regrow between rains.



Filter strip

Storm water ponds (wet ponds) consist of a permanent pond, where solids settle during and between storms, and a zone of emergent wetland vegetation where dissolved contaminants are removed through biochemical processes. Wet ponds are usually developed as water features in a community, increasing the value of adjacent property. Other than landscape maintenance, only annual inspection of the outlets and shoreline is required. Vegetation should be harvested every 3 to 5 years, and sediment removed every 7 to 10 years. Wet ponds can achieve 40 to 60 percent phosphorus removal and 30 to 40 percent total nitrogen removal.



Storm water pond

Constructed wetlands are similar to wet ponds, with more emergent aquatic vegetation and a smaller open water area. Storm water wetlands are different from natural wetlands in that they are designed to treat storm water runoff, and typically have less biodiversity than natural wetlands. A wetland should have a settling pond, or forebay, if significant upstream soil erosion

is anticipated. Coarse particles remain trapped in the forebay, and maintenance is performed on this smaller pool. Wetlands remove the same pollutants as wet ponds through settling of solids and biochemical processes, with about the same efficiency. Maintenance requirements for wetlands are similar to those of wet ponds.

Infiltration practices (basins and trenches) are long, narrow stone-filled excavated trenches, 3 to 12 feet deep. Runoff is stored in the basin or in voids between the stones in a trench and slowly infiltrates into the soil matrix below, where filtering removes pollutants. Infiltration devices alone do not remove contaminants, and should be combined with a pretreatment practice such as a swale or sediment basin to prevent premature clogging. Maintenance consists of inspections annually and after major rain storms and debris removal, especially in inlets and overflow channels. Infiltration devices and associated practices can achieve up to 70 to 98 percent contaminant removal.



Infiltration basin

Swirl-type concentrators are underground vaults designed to create a circular motion to encourage sedimentation and oil and grease removal. The currents rapidly separate out settleable grit and floatable matter, which are concentrated for treatment, while the cleaner, treated flow discharges to receiving waters. Swirl concentrators have demonstrated total suspended solids and BOD removal efficiencies exceeding 60 percent.

BMPs for Class V storm water drainage wells address siting, design, and operation of these wells. Siting BMPs for storm water drainage wells include minimum setbacks from surface waters, drinking water wells, or the water table. Storm water drainage wells may also be prohibited from areas of critical concern, such as source water protection areas, or from areas where the engineering properties of the soil are not ideal for their performance. Available design BMPs for storm water drainage wells include sediment removal devices (such as oil/grit separators or filter strips), oil and grease separators, and pretreatment devices such as infiltration trenches or wetlands (described above). Maintenance of these BMPs is crucial to their proper operation. Management measures related to operation include spill response, monitoring, and maintenance procedures. Source separation, or keeping runoff from industrial areas away from storm water drainage wells, involves using containment devices such as berms or curbs (see the fact sheets on vehicle washing and small quantity chemical use for more information on these devices).

EPA's National Pollutant Discharge Elimination System (NPDES) Permitting Program regulates storm water runoff from municipal separate storm sewer systems (MS4s) and industrial activity (including construction). The current rules establish permit requirements for more than 5,000 MS4s nationwide. NPDES storm water permits issued to MS4s require these MS4s to develop the necessary legal authority to reduce the discharge of pollutants in storm water to the maximum extent practicable and to develop and implement a storm water management program that includes:

- Structural and source control measures to reduce pollutants from runoff from commercial and residential areas, including maintenance, monitoring, and planning activities;
- Detection and removal of illicit discharges and improper disposal into the storm sewer;
- Monitoring and control of storm water discharges from certain industrial activities; and
- Construction site storm water control.

In addition, the storm water rule for certain small MS4s requires post-construction storm water management controls. These local controls are in addition to existing federal regulations that require NPDES permits of all construction activities disturbing greater than one acre.

Recently, EPA developed a menu of BMPs that provides more than 100 fact sheets on measures that small MS4s could use to control urban storm water runoff. The menu is available from EPA's Web site at www.epa.gov/npdes.

FOR ADDITIONAL INFORMATION

These sources contain information on storm water management measures. All of the documents listed are available for free on the Internet. State departments of transportation or agriculture, whose contact information can be found on the Internet or in the phone book, are also good sources of information.

To pass local ordinances or regulations to affect storm water controls, contact city or county public works departments, zoning offices, permitting offices, or transportation departments, who typically have the authority to pass local ordinances. Contact local government authorities in your area to see if there are ordinances in place to manage storm water. Numerous examples of local source water protection-related ordinances for various potential contaminant sources can be found at <http://www.epa.gov/owow/nps/ordcom/>, <http://www.epa.gov/owow/nps/ordinance/>, and <http://www.epa.gov/owow/nps/ordinance/links.htm>.

The following resources provide information on selection and design of specific management measures:

The Center for Watershed Protection's Stormwater Manager's Resource Center (www.stormwatercenter.net) provides technical assistance storm water management issues.

Northern Arizona University offers a course on wet weather flow management, materials are available at <http://jan.ucc.nau.edu/~dmh3/egr499/>.

Texas Nonpoint SourceBOOK (www.txnpsbook.org) contains four manuals on storm water Best Management Practices, including "Urban Nonpoint Source Management," and an interactive BMP selector.

U.S. EPA, Office of Ground Water and Drinking Water. (September 1999). *The Class V Underground Injection Control Study. Volume 3: Storm Water Drainage Wells*. EPA/816-R-99-014c. Retrieved May 2, 2001, from the World Wide Web: <http://www.epa.gov/safewater/uic/classv/stw-fact.pdf>

U.S. EPA, Office of Science and Technology. (August 1999). *Preliminary Data Summary of Urban Stormwater Best Management Practices*. EPA-821-R-99-012. Retrieved February 7, 2001, from the World Wide Web: <http://www.epa.gov/OST>.

U.S. EPA, Office of Wastewater Management. (September 1992). *Storm Water Management for Industrial Activities: Developing Pollution Prevention Plans and BMPs*. Retrieved February 6, 2001, from the World Wide Web: <http://www.epa.gov/owrm/sw/indguide/index.htm>

U.S. EPA, Office of Wetlands, Oceans, and Watersheds. (January 1993). *Guidance Specifying Management Measures for Sources of Nonpoint Pollution in Coastal Waters*. EPA-840-B-93-001c. Retrieved February 15, 2001, from the World Wide Web: <http://www.epa.gov/OWOW>

Washington State Department of Transportation. (February 1995). *Highway Runoff Manual*. M 31-16. Retrieved February 15, 2001, from the World Wide Web: <http://www.wsdot.wa.gov/fasc/engineeringpublications/manuals/highway.pdf>

Wyoming Department of Environmental Quality. (February 1999). *Urban Best Management Practices for Nonpoint Source Pollution*. Draft. Retrieved February 21, 2001, from the World Wide Web: <http://deq.state.wy.us/wqd/urbbmpdoc.htm>

University extension services are excellent sources for information on water quality issues, including storm water management. The Oregon Department of Agriculture offers comprehensive list of links to many of these on its Web site (http://www.oda.state.or.us/Natural_Resources/wq_ces.htm).

Following are examples of extension services that offer fact sheets on a variety of storm water management measures, including best management practices:

Iowa State University Extension (<http://www.extension.iastate.edu/Pages/pubs/>).

North Carolina Cooperative Extension Service (<http://www.ces.ncsu.edu/resources/>).

Oklahoma State University, Division of Agricultural Sciences and Natural Resources (<http://agweb.okstate.edu/pearl/wqs>).

Purdue University Cooperative Extension Service (<http://www.agcom.purdue.edu/AgCom/Pubs/menu.htm>).

ORDINANCE NO. 2108

BILL NO. 6 (1992)

Draft 1

A BILL FOR AN ORDINANCE AMENDING
CHAPTER 16.20 OF THE MAUI COUNTY
CODE, PERTAINING TO THE PLUMBING CODE

BE IT ORDAINED BY THE PEOPLE OF THE COUNTY OF MAUI:

SECTION 1. Title 16 of the Maui County Code is amended by adding a new section to Chapter 10 of the Uniform Plumbing Code to be designated and to read as follows:

"16.20.675 Section 1050 added. Chapter 10 of the Uniform Plumbing Code is amended by adding a new section, pertaining to low-flow water fixtures and devices, to be designated and to read as follows:

Sec. 1050 Low-flow water fixtures and devices. (a) This section establishes maximum rates of water flow or discharge for plumbing fixtures and devices in order to promote water conservation.

(b) For the plumbing fixtures and devices covered in this section, manufacturers or their local distributors shall provide proof of compliance with the performance requirements established by the American National Standards Institute (ANSI) and such other proof as may be required by the director of public works. There shall be no charge for this registration process.

(c) Effective December 31, 1992, only plumbing fixtures and devices specified in this section shall be offered for sale or installed in the County of Maui, unless otherwise indicated in this section. All plumbing fixtures and devices which were installed before December 31, 1992, shall be allowed to be used, repaired or replaced after December 31, 1992.

(1) Faucets (kitchen): All kitchen and bar sink faucets shall be designed, manufactured, installed or equipped with a flow control device or aerator which will prevent a water flow rate in excess of two and two tenths gallons per minute at sixty pounds per square inch of water pressure.

(2) Faucets (lavatory): All lavatory faucets shall be designed, manufactured, installed or equipped with a flow control device or aerator which will prevent a water flow rate in excess of two and two tenths gallons per minute at sixty pounds per square inch of water

pressure.

(3) Faucets (public rest rooms): In addition to the lavatory requirements set forth in paragraph (2), lavatory faucets located in rest rooms intended for use by the general public shall be of the metering or self-closing types.

(4) Hose bibbs: Water supply faucets or valves shall be provided with approved flow control devices which limit flow to a maximum three gallons per minute.

EXCEPTIONS: (A) Hose bibbs or valves not used for fixtures or equipment designated by the director of public works.

(B) Hose bibbs, faucets, or valves serving fixed demand, timing, or water level control appliances, and equipment or holding structures such as water closets, pools, automatic washers, and other similar equipment.

(5) Showerheads: Showerheads, except where provided for safety or emergency reasons, shall be designed, manufactured, or installed with a flow limitation device which will prevent a water flow rate in excess of two and one-half gallons per minute at eighty pounds per square inch of water pressure. The flow limitation device must be a permanent and integral part of the showerhead and must not be removable to allow flow rates in excess of two and one-half gallons per minute or must be mechanically retained requiring force in excess of eight pounds to remove.

(6) Urinals: Urinals shall be designed, manufactured, or installed so that the maximum flush will not exceed one gallon of water. Adjustable type flushometer valves may be used provided they are adjusted so the maximum flush will not exceed one and six tenths gallons of water.

(7) Water closets (toilets): Water closets shall be designed, manufactured, or installed so that the maximum flush will not exceed one and six tenths gallons of water.

(d) Beginning December 31, 1992, it is unlawful to sell or install any plumbing fixtures or devices not specified in this section, except as permitted under this section.


(e) The director of public works may exempt the use of low-flow water fixtures and devices if there is a finding that the use of such fixtures and devices would not be consistent with accepted engineering practices and would be detrimental to the public health, safety and welfare.

(f) Any person violating this section shall be fined \$250 for each violation and shall correct all instances of non-compliance for which a citation is issued. Violation of this section shall constitute a violation as defined in section 701-107 Hawaii Revised Statutes and shall be enforceable by employees of the department of public works. The foregoing fine may also be imposed in a civil, administrative proceeding pursuant to Rules and Regulations adopted by the department of public works in accordance with Chapter 91 Hawaii Revised Statutes."

SECTION 2. New material is underscored. In printing this bill, the County Clerk need not include the underscoring.

SECTION 3. This ordinance shall take effect upon its approval.

APPROVED AS TO FORM
AND LEGALITY:


HOWARD M. FOXUSHIMA
Deputy Corporation Counsel
County of Maui
C:\wp51\ords\flows4\pk


WE HEREBY CERTIFY that the foregoing BILL NO. 6 (19 92), Draft 1

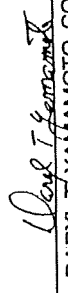
1. Passed FINAL READING at the meeting of the Council of the County of Maui, State of Hawaii, held on the 1st day of May, 1992, by the following votes:

Howard S. Kihune Chair	Patrick S. Kawano Vice-Chair	Vince G. Bago, Jr.	Goro Hokama	Allice L. Lee	Ricardo Medina	Wayne K. Nishiki	Joe S. Tanaka	Laniela Teruya Drummond
Aye	Aye	Excused	Excused	Aye	Aye	Aye	Aye	Aye


2. Was transmitted to the Mayor of the County of Maui, State of Hawaii, on the 1st day of May, 1992.

DATED AT WAILUKU, MAUI, HAWAII, this 1st day of May, 1992.



HOWARD S. KIHUNE, CHAIR
Council of the County of Maui


DARYL T. YAMAMOTO, COUNTY CLERK
County of Maui

THE FOREGOING BILL IS HEREBY APPROVED THIS 5th DAY OF MAY, 1992.


LINDA CROCKETT LINGLE, MAYOR
County of Maui

I HEREBY CERTIFY that upon approval of the foregoing BILL by the Mayor of the County of Maui, the said BILL was designated as ORDINANCE NO. 2108 of the County of Maui, State of Hawaii.


DARYL T. YAMAMOTO, COUNTY CLERK
County of Maui

Passed First Reading on January 17, 1992.
Effective date of Ordinance May 5, 1992.

I HEREBY CERTIFY that the foregoing is a true and correct copy of Ordinance No. 2108, the original of which is on file in the Office of the County Clerk, County of Maui, State of Hawaii.

Dated at Wailuku, Hawaii, on

County Clerk, County of Maui

"THE COSTLY DRIP"



Slowly Dripping
Spigot Wastes
15 Gallons a day.



1/32" Leak Wastes
25 Gallons a day.



1/16" Stream Wastes
100 Gallons a Day.



1/8" Stream Wastes
400 Gallons a day.

Zone-specific Native and Polynesian plants for Maui County

Zone 2

Type	Scientific Name	Common Name	Height	Spread	Elevation	Water req.
Tr	<i>Nestegis sandwicensis</i>	olopua	15'	15'	1,000' to 3,000'	Dry to Medium
Tr	<i>Pleomele auwahiensis</i>	halapepe	20'			
Tr	<i>Rauvolfia sandwicensis</i>	hao	20'	15'	sea to 3,000'	Dry to Medium
Tr	<i>Santalum ellipticum</i>	coastal sandalwood, 'ili-ahi	8'	8'	sea to 3,000'	Dry to Medium
Tr	<i>Sophora chrysophylla</i>	mamane	15'	15'	1,000' to 3,000'	Medium
V	<i>Alyxia oliviformis</i>	maile	Vine		sea to 6,000'	Medium to Wet

Zone-specific Native and Polynesian plants for Maui County

Zone 2

TYPE: F Fern G Grass Gr Ground Cover Sh Shrub P Palm S Sedge Tr Tree V Vine

Type	Scientific Name	Common Name	Height	Spread	Elevation	Water req.
F	<i>Psilotum nudum</i>	moa, moa kula	1'	1'	sea to 3,000'	Dry to Wet
F	<i>Sadleria cyatheoides</i>	'ama'u, ama'uma'u				
G	<i>Eragrostis monticola</i>	kalamalo	1'	2'	sea to 3,000'	Dry to Medium
Gr	<i>Ipomoea tuboides</i>	Hawaiian moon flower, 'uala	1'	10'	sea to 3,000'	Dry to Medium
Gr	<i>Peperomia leptostachya</i>	'ala'ala-wai-nui	1'	1'	sea to 3,000'	Dry to Medium
Gr	<i>Plumbago zeylanica</i>	'ille'e	1'			
Gr - Sh	<i>Hibiscus calyphyllus</i>	ma'o hau hele, Rock's hibiscus	3'	2'	sea to 3,000'	Dry to Medium
Gr - Sh	<i>Lipochaeta rockii</i>	nehe	2'	2'	sea to 3,000'	Dry to Medium
Sh	<i>Argemone glauca</i> var. <i>deciplens</i>	pua kala	3'	2'	sea to 3,000'	Dry to Medium
Sh	<i>Artemisia mauiensis</i> var. <i>diffusa</i>	Maui wormwood, 'ahinahina	2'	3'	1,000' to higher	Dry to Medium
Sh	<i>Chenopodium oahuense</i>	'aheahea, 'aweoweo	6'		sea to higher	Dry to Medium
Sh	<i>Dianella sandwicensis</i>	'uki	2'	2'	1,000' to higher	Dry to Medium
Sh	<i>Lipochaeta lavarum</i>	nehe	3'	3'	sea to 3,000'	Dry to Medium
Sh	<i>Osteomeles anthyllifolia</i>	'ulei, eluehe	4'	6'	sea to 3,000'	Dry to Medium
Sh	<i>Senna gaudichaudii</i>	kolomana	5'	5'	sea to 3,000'	Dry to Medium
Sh	<i>Styphelia tameiameia</i>	pukiawe	6'	6'	1,000' to higher	Dry to Medium
Sh	<i>Vitex rotundifolia</i>	pohinahina	3'	4'	sea to 1,000'	Dry to Medium
Sh - Tr	<i>Myoporum sandwicense</i>	naio, false sandalwood	10'	10'	sea to higher	Dry to Medium
Sh - Tr	<i>Nototrichium sandwicense</i>	kulu'i	8'	8'	sea to 3,000'	Dry to Medium
Sh - Tr	<i>Dodonaea viscosa</i>	'a'ali'i	6'	8'	sea to higher	Dry to Medium
Tr	<i>Acacia koa</i>	koa	50' - 100'	40' - 80'	1,500' to 4,000'	Dry to Medium
Tr	<i>Charpentiera obovata</i>		15'			
Tr	<i>Erythrina sandwicensis</i>	wiliwili	20'	20'	sea to 1,000'	Dry
Tr	<i>Metrosideros polymorpha</i> var. <i>macrophylla</i>	ohi'a lehua	25'	25'	sea to 1,000'	Dry to Wet

Selection

As a general rule, it is best to select the largest and healthiest specimens. However, be sure to note that they are not pot-bound. Smaller, younger plants may result in a low rate of plant survival.¹ When selecting native species, consider the site they are to be planted in, and the space that you have to plant. For example: Mountain species such as koa and maile will not grow well in hot coastal areas exposed to strong ocean breezes. Lowland and coastal species such as wiliwili and Kou require abundant sunshine and porous soil. They will not grow well with frequent cloud cover, high rainfall and heavy soil.

Consider too, the size that the species will grow to be. It is not wise to plant trees that will grow too large.² Overplanting tends to be a big problem in the landscape due to the underestimation of a species' height, width or spread.

A large, dense canopied tree such as the kukui is a good shade tree for a lawn. However, it's canopy size and density of shade will limit what can be planted in the surrounding area. Shade cast by a koa and ohia lehua is relatively light and will not inhibit growth beneath it.

Keep seasons in mind when you are selecting your plants. Not all plants look good year round, some plants such as ilima will look scraggly after they have flowered and formed seeds. Avoid planting large areas with only one native plant. Mixing plants which naturally grow together will ensure the garden will look good all year round.³ Looking at natural habitats helps to show how plants grow naturally in the landscape.

When planting an area with a mixed-ecosystem, keep in mind the size and ecological requirements of each plant. Start with the hardiest and most easily grown species, but allow space for fragile ones in subsequent plantings.

Acquiring natives

Plants in their wild habitat must be protected and maintained. It is best and easiest to get your plants from nurseries (see list), or friend's gardens. Obtain proper permits from landowners and make sure you follow a few common sense rules:

- ▶ collect sparingly from each plant or area.
- ▶ some plants are on the state or Federal Endangered Species list. Make sure you get permits (see app. A,B)

¹ K. Nagata, P.6

² K. Nagata, P.9

³ Nagata, P.9

Soil

Once you have selected your site and the plants you wish to establish there, you must look at the soil conditions on the site. Proper soil is necessary for the successful growth of most native plants, which perform poorly in hard pan, clay or adobe soils. If natives are to be planted in these types of soil, it would be wise to dig planting holes several times the size of the rootball and backfill with 50-75% compost.⁴ A large planting hole ensures the development of a strong root system. The plant will have a headstart before the roots penetrate the surrounding poor soil.⁵

It is recommended that native plants not be planted in ground that is more dense than potting soil. If there is no alternative, dig a hole in a mound of soil mixed with volcanic cinder which encourages maximum root development. Fill the hole with water, if the water tends to puddle or drain too slowly, dig a deeper hole until the water does not puddle longer than 1 or 2 minutes.⁶ Well-drained soil is one of the most important things when planting natives as you will see in the next section.

Irrigation

Most natives do very poorly in waterlogged conditions. Do not water if the soil is damp. Water when the soil is dry and the plants are wilting. Once established, a good soaking twice a week should suffice. Deep soaking encourages the development of stronger, and deeper root systems. This is better than frequent and shallow watering which encourage weaker, more shallow root systems.

The following is a watering schedule from Kenneth Nagata's Booklet, *How To Plant A Native Hawaiian Garden*:

WATER REQUIREMENT	WATERING FREQUENCY
Heavy	3x / week
Moderate	2x / week
Light	1x / week

Red clay soils hold more water for a longer period of time than sandy soils do. If your area is very sunny or near a beach, things will dry out faster. Even in the area of one garden, there are parts that will need more or less water. Soils can vary and amount of shade and wind differ. After plants are established (a month or two for most plants, up to a year for some trees), you can back off watering.

⁴ Nagata, p. 6.

⁵ Nagata, p. 8

⁶ Nagata, p. 8

Automatic sprinkler systems are expensive to install and must be checked and adjusted regularly. Above-ground systems allow you to monitor how much water is being put out, but you lose a lot due to malfunctioning of sprinkler heads and wind. The most efficient way to save water and make sure your plants get enough water, is to hand-water. This way you are getting our precious water to the right places in the right amounts.⁷

Fertilizer

An all-purpose fertilizer 10-10-10 is adequate for most species. They should be applied at planting time, 3 months later, and 6 months thereafter. Use half the dosage recommended for ornamentals and pay special attention to native ferns which are sensitive to strong fertilizers. Use of organic composts and aged animal manures is suggested instead of chemical fertilizers. In addition, use of cinders for providing trace minerals is strongly recommended.⁸

Natives are plants which were here hundreds of years before the polynesians inhabited the Hawaiian Islands. They were brought here by birds, or survived the harsh ocean conditions to float here. They are well-adapted to Hawaii's varying soil and environmental conditions. This is why they make prime specimens for a xeriscape garden. However, natives will not thrive on their own, especially under harsh conditions. On the other hand, like any other plant, if you over-water and over-fertilize them, they will die. Follow the instructions given to you by the nursery you buy the plant from, or from this booklet. Better yet, buy a book (suggested readings can be found in the bibliography in the back of this pamphlet), read it, and learn more about native plants. I guarantee that you will be pleased with the results.

⁷ Bornhorst, p. 19-20

⁸ Nagata, p. 6

Propagation

There are many ways to propagate and plant-out native Hawaiian species. One of the most thorough and helpful book is Heidi Bornhorst's book, *Growing Native Hawaiian Plants*. The easiest, and best way to obtain natives for the novice gardener is to get them from a reputable nursery (see appendix c). That way all you will have to do is know how to transplant (if necessary) and plant-out when you are ready. These are the two methods I have listed here.

Transplanting

1. Use pots that are one size bigger than the potted plant is in
2. Get your potting medium ready

Good potting medium is a 1/2, 1/2 mixture of peat moss and perlite. If the plant is from a dry or coastal area, add chunks of cinder or extra perlite. If it is a wet forest species, add more peat moss or compost. Be aware that peat moss is very acidic and certain plants react severely to acidity.

If the plant is to eventually be planted into the ground, make a mix of equal parts peat moss, perlite, and soil from the area in which the plant is to be planted. Slow-release fertilizer can be mixed into the potting medium.

3. Once pots, potting medium, fertilizer and water are ready, you can begin re-potting. Keep the plant stem at the same depth it was in the original pot. Avoid putting the plant in too large a pot, as the plant may not be able to soak up all the water in the soil and the roots may drown and rot.

Mix potting medium and add slow-release fertilizer at this time. Pre-wet the medium to keep dust down and lessen shock to the plant. Put medium in bottom of pot. Measure for the correct depth in the new pot. Make sure there is from 1/2 to 2 inches from the top of the pot so the plant can get adequate water. Try to stand the plant upright and center the stem in the middle of the pot.

Water the plant thoroughly after transplanting. A vitamin B-1 transplanting solution can help to lessen the transplant shock. Keep the plant in the same type of environment as it was before, sun or shade. If roots were broken, trim off some of the leaves to compensate for the loss.⁹

Planting out

1. Plant most native Hawaiian plants in a sunny location in soil that is well-drained.
2. Make the planting hole twice as wide as the root ball or present pot, and just as deep. If the soil is clay-like, and drains slowly, mix in some coarse red or bland cinder, coarse perlite or

⁹ Bornhorst, p. 20-21

coarse compost. Place some slow-release fertilizer at the bottom of the hole.

3. Carefully remove the plant from the container and place it in the hole.

The top of the soil should be at the same level as the top of the hole, if it is too high or too low, adjust the soil level so that the plant is at the right depth.

4. Water thoroughly after you transplant.

Mulch

Most natives cannot compete with weeds, and therefore must be weeded around constantly in order to thrive. Mulch is a practical alternative, which discourages and prevents weeds from growing.

Hawaii's hot, humid climate leads to the breaking down of organic mulches. Thick organic mulches such as wood chips and leaves, may also be hiding places for pests.

Stone mulches are attractive, permanent and can help to improve soil quality. Red or black cinder, blue rock chips, smooth river rocks and coral chips are some natural choices.¹⁰ Macadamia nut hulls are also easy to find and can make a nice mulch.¹¹

Never pile up mulch right next to the stem or trunk of a plant, keep it a few inches away.

PLACES TO SEE NATIVES ON:

The following places propagate native Hawaiian plants from seeds and/or cuttings. Their purpose is to protect and preserve these native plants. Please contact them before going to view the sites, they can provide valuable information and referral to other sources.

Maui:

1. Hoolawa Farms, P.O. Box 731, Haiku, Hawaii, 96708 572-4835
2. The Hawaiian Collection, 1127 Manu St., Kula, Hawaii, 96790 878-1701
3. Kula Botanical Gardens, RR 4, Box 228, Kula, Hawaii, 96790 878-1715
4. Maui Botanical Gardens, Kanaloa Avenue across from stadium 243-7337
5. Kula Forest Reserve, access road at the end of Waipouli Rd.
Call the Maui District Forester 984-8100
6. Wailea Point, Private Condominium residence, 4000 Wailea Alanui,
public access points at Four Seasons Resort or Polo Beach 875-9557
7. Kahanu Gardens, National Tropical Botanical Garden,
Alau Pt, Hana, Hawaii, 96713 248-8912
9. Kahului Library Courtyard, 20 School Street, Kahului, Hawaii 873-3097

¹⁰ Bornhorst, p. 24

¹¹ Nagata, p. 7

ZONES

The Maui County Planting Plan has compiled a system of 5 zones of plant growth for Maui County. The descriptions of zones and maps for these zones are as follows:

- Zone 1: Wet areas on the windward side of the island. More than 40 inches of rain per year. Higher than 3,000 feet.
- Zone 2: Cool, dry areas in higher elevations (above 1,000 feet). 20 to 40 inches of rain per year.
- Zone 3: Low, drier areas, warm to hot. Less than 20 inches of rain per year. Sea level to 1,000 feet.
- Zone 4: Lower elevations which are wetter due to proximity of mountains. 1,000 to 3,000 feet.
- Zone 5: Salt spray zones in coastal areas on the windward side.

These zones are to be used as a general guide to planting for Maui County. In addition to looking at the maps, read the descriptions of the zones and decide which zone best fits your area. Plants can be listed in more than one zone and can be planted in a variety of conditions. For best results, take notes on the rainfall, wind, sun and salt conditions of your site. Use the zones as a general guide for selection and read about the plants to decide which best fits your needs as far as care and or function.

PLACES TO BUY NATIVES ON:

Maui:

- | | | |
|----|--|----------|
| 1. | Hoolawa Farms
P O Box 731
Haiku HI 96708
The largest and best collection of natives in the state. They will deliver, but it's worth the drive to go and see!
Will propagate upon request | 575-5099 |
| 2. | Kula True Value Nursery
Many natives in stock
Get most of their plants from Hoolawa Farms
They take special requests | 878-2551 |
| 3. | Kihei Garden and Landscape | 244-3804 |
| 4. | Kihana Nursery, Kihei | 879-1165 |
| 5. | The Hawaiian Collection
Specialize in Sandalwood propagation
Will propagate special requests | 878-1701 |

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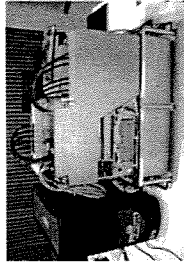
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Tue Jun 7, 2005

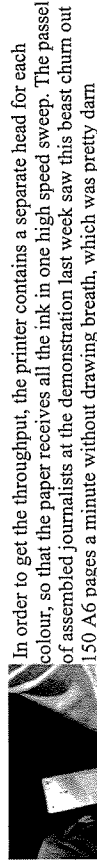
World's fastest inkjet printer?

Posted by Red in [future tech](#) | [E-Mail](#) [This Entry](#)



The Brother Industries high speed inkjet printer in prototype form. Codenamed Cobra, this little puppy can spit out any size of print output at around 170 pages per minute. OK, you want me to back up and repeat that? Any size of printed inkjet paper output at 170 pages every sixty seconds. Demonstrated for the first time ever last week at a Brother press seminar. How are they doing it? Well....

So apparently the secret lies in the use of new Piezo Inkjet Line Head technology, which prints at 600x600 dpi, but doesn't actually move at all. The ink is transferred at high speed as the paper passes underneath the static nozzles. (see below left - click on all images for full view)



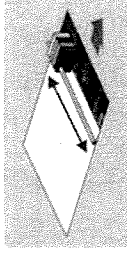
In order to get the throughput, the printer contains a separate head for each colour, so that the paper receives all the ink in one high speed sweep. The passel of assembled journalists at the demonstration last week saw this beast churn out 150 A6 pages a minute without drawing breath, which was pretty darn

<http://redferret.net/?p=5291>

6/8/2005

impressive. (see below right for a scan of the actual printed output)

The company boffins at the demo told us that in order to achieve this speed for larger paper sizes, they just need to connect up more heads in a wider array. For instance, two heads joined together longways would give A4 printing. The concept of poster sized inkjet prints being produced at offset litho printing speeds is little short of miraculous. But just think of the ink costs...ouch!



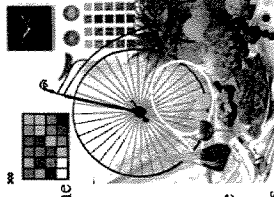
Conventional inkjet



New technology

Apparently this technology also features the lowest power requirements of any inkjet head on the market, and is smaller than equivalent spec products, which should eventually mean good things for home as well as industrial users. Eventually? Well, the technology was first announced at this year's Cebit exhibition in Germany, but this was the first ever live demonstration to the media, and the company is being very coy on any production dates. In fact it seems that the tech needs some cooperative funding (i.e. a production partner?) in order to progress further. And no word on potential retail pricing was given either.

So for now the printer is seeing action only at the World Fair in Aichi, Japan, printing out A6 sheets for tourist visitors to the Brother pavilion. Here's hoping we see more of this amazing technology sooner rather than later. In the meantime here's a [PDF](#) of the technology paper.



Specification Notes.

Head - 2656 nozzles per head, 600 dpi, 108 mm width (4.25 inches).

Print speed - 800 mm per second.

Energy saving - Deformable Piezo actuator provides 1/14 of the power requirement of conventional nozzles. For example, the A6 picture sample on the right requires only 3 watts of power, at 150 sheets per minute.

Size - Trapezoidal nozzle zone shape provides for dense arrangement of cavities. The result is a head which is 152 mm wide, 22 mm deep and 1 mm high. Heads can be arranged in longer arrays as needed.

Droplet size - Unspecified. 4 sizes available.

Reliability - 10 billion dots/nozzle or more (still testing).

Related Entries:

- [Ink jet survey.](#)
- [Inkjet cartridges too expensive?](#)
- [Roll yer own photos.](#)
- [Inksaver.](#)
- [Inky fingers...](#)

comments

<http://redferret.net/?p=5291>

6/8/2005



STATE OF HAWAII

DEPARTMENT OF HAWAIIAN HOME LANDS

P.O. BOX 1879

HONOLULU, HAWAII 96805

July 27, 2005

Mr. George Y. Tengan, Director
County of Maui
Department of Water Supply
200 South High Street
Wailuku, Maui, Hawaii 96793-2155

Dear Mr. Tengan:

SUBJECT: Department of Hawaiian Home Lands (DHHL) Waiohuli
Homestead Community Final Environmental Assessment
/Finding of No Significant Impact (FONSI)

Thank you for your letter dated July 1, 2005, including the information on water protection. We offer the following responses to your comments.

1. We understand that the project site is served by the Upcountry/Makawao system, which is supplied by the Makawao Aquifer and streams of the Koolau system. This will be stated in the Final EA.
2. The anticipated consumption for the proposed 337-unit project would be approximately 202,200 gallons per day (gpd) based on water system standards. With the existing 321-unit Kula Residential - Unit 1, the planned 99-unit Kula Residential - Unit 2 in-fill development, and the proposed 69-unit Keokea Agricultural Lots, approximately 293,400 gpd of the 500,000 gpd committed in the Water Credits Agreement will be used. Accordingly, approximately 206,600 gpd is available and the proposed Waiohuli Homestead Community will use only 202,200 gpd.
3. Thank you for your confirmation that the DHHL has met its source requirement.
4. We will note in the Final EA that an 8-inch waterline is

MICHAEL A. KANE
CHAIRMAN
HAWAIIAN HOMES COMMISSION
BEN HENDERSON
DEPUTY TO THE CHAIRMAN
KAULANA H. PARK
EXECUTIVE ASSISTANT

Mr. George Y. Tengan, Director
July 22, 2005
Page 2

located along Lauie Drive near the project site, and storage is provided by the 2-MG Kula Kai Tank. The project will be required to meet standards for domestic, irrigation, and fire flow calculations. The fire flow requirement for single-family units is 1,000 gallons per minute at 350 feet spacing for a 2-hour duration

5. The project site overlies the Makawao Aquifer, which has a sustainable yield of 7 MGD. As recommended, best management practices for construction will be implemented to minimize infiltration and runoff.
6. The conservation measures recommended in your letter will be considered in the development of the project and encouraged to future residents of the Waiohuli Homestead Community.

Thank you again for your participation in the Environmental Assessment process. If you have any questions regarding this project, please call Darrell Ing of our Land Development Division at 586-3844.

Aloha and mahalo,


Michael A. Kane, Chairman
Hawaiian Homes Commission

c: Anson Murayama, Community Planning and Engineering, Inc.
Lacey Kazama, PBR HAWAII



ALAN M. ARAKAWA
MAYOR

OUR REFERENCE
YOUR REFERENCE

POLICE DEPARTMENT COUNTY OF MAUI

55 MAHALANI STREET
WAILUKU, HAWAII 96793
(808) 244-6400
FAX (808) 244-6411



THOMAS M. PHILLIPS
CHIEF OF POLICE
KEKUAUPIO R. AKANA
DEPUTY CHIEF OF POLICE

June 16, 2005

Ms. Lacey Kazama
PBR Hawaii
1001 Bishop Street
ASB Tower, Suite 650
Honolulu, HI 96813

Dear Ms. Kazama:

SUBJECT: Waiohuli Homestead Community
TMK: 2-2-002: 014 (portion) and 055 (portion)

Thank you for your letter of June 2, 2005, requesting comments on the above subject.

We have reviewed the Draft Environmental Assessment (EA) and have enclosed our comments and recommendations. Thank you for giving us the opportunity to comment on the proposed project.

Very truly yours,

Glenn Miyahira
for: Thomas M. Phillips
Chief of Police

Enclosure

c: Michael Foley, Maui County Planning Department
Office of Environmental Quality Control

COPY

*Transmit to
PBR Hawaii
per [signature]
6/16/05*

TO : THOMAS PHILLIPS, CHIEF OF POLICE, COUNTY OF MAUI
VIA : GEORGE FONTAINE, CAPTAIN, WAILUKU PATROL
FROM : MITCHELL PELLAZAR, SERGEANT, WAILUKU PATROL
SUBJECT : WAIHULI HOMESTEAD COMMUNITY
TMK: 2-2-002: 014 & 055

This To-From is being submitted in regards to comments on the above-named sub-division Draft Environmental Assessment.

Comments:

1. Traffic onto Kula Highway may not be affected significantly in the area of Kula Residential Lot at this time with the development of the Waiohuli Homestead Community, but future development in the Keokea area, could require the widening of Kula Highway in the area of the Kula Residential Lots entrances.
2. With the estimated 337-new residential units planned for the Waiohuli Homestead Community, even with the listed private schools in the Upcountry area, it is anticipated that a majority of the students will attend public schools, Kula Elementary, Kalama Intermediate and King Kekaulike High School which will increase traffic congestion in these areas and will affect the AM and PM peak traffic flow for Kula Elementary School, the entrance to Kamehameha Schools and the Kulamalu Sub-division and King Kekaulike High School. This will also affect the overall traffic level of service on the intersection at Haleakala Highway/Kula Highway commonly referred to as "5-trees".
3. At this time due to Maui Land and Pineapple cancelling the proposed project for the Upcountry Town Center, traffic on Makawao Avenue at the Old Haleakala Highway and Haleakala Highway By-pass intersections should not be affected significantly. However it is anticipated that ML&P will develop this property in the future.
4. Roadway lanes within the Waiohuli Homestead Community should be wide enough and adequate turn radius to accommodate the larger Fire Department equipment currently in service.
5. Regarding Police Service: To clarify on the submitted DEA on page 67 (6.8) The Upcountry area is served by Officers dispatched out of the Main Police headquarters in Wailuku. The Police Upcountry area includes: Pukalani, Makawao, Kula, Paia and Ha'iku. Due to promotions and retirements, the Kula Community Officer position, has not been filled since 2001, and the office at the

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STATE OF HAWAII



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DEPUTY TO THE CHAIRMAN
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EXECUTIVE ASSISTANT

STATE OF HAWAII
DEPARTMENT OF HAWAIIAN HOME LANDS
P.O. BOX 1879
HONOLULU, HAWAII 96805

Kula Community Center is not staffed by an officer on a regular basis, thus response time to the project area or any outlying areas in the Keokea / Ulupalakua areas for any emergency will be delayed. Though aggressive measures are being taken by the Police Department to fill all vacancies, it is unknown when the Kula Community Police Officer position will be staffed.

6. Kula Highway in the area of the Kula Residential Lots should be planned to accommodate road widening projects in the future, as it appears at this time to have sufficient sight-distance for vehicle safety. However shoulder improvements would need to be made for roadway widening.

The comments submitted are suggestions regarding this Draft Environmental Assessment.

Submitted for your information.

Mr. Thomas M. Phillips, Chief of Police
County of Maui
Police Department
55 Mahalani Street
Wailuku, Maui, Hawaii 96793

Attn: Acting Assistant Chief Glenn Miyahira

Dear Chief Phillips:

SUBJECT: Department of Hawaiian Home Lands (DHHL) Waiohuli
Homestead Community Final Environmental
Assessment/Finding of No Significant Impact (FONSI)

Thank you for your letter dated June 16, 2005. We offer the following responses to your comments.

Sgt. Mitchell Pellazar
Sgt. Mitchell Pellazar E-8468
Wailuku Patrol - Administrative Sergeant
06/15/05 - 1330 hours

1. The DHHL's 342-acre Keokea parcel is being developed into 69 agricultural lots, averaging from 2.0 to 2.5 acres. The population density, and thus impacts to traffic, will be lower than that of residential lots. The Final Environmental Assessment for the Keokea project was published in December 2001. It concluded that "the proposed project will not have any significant adverse impacts on circulation and traffic in the area."
2. Additional students residing at the proposed Waiohuli Homestead Community may increase traffic congestion near Kula Elementary, Kalama Intermediate, and King Kekaulike High. This increase in traffic may affect the AM and PM peak hour traffic flow near the schools and the level of service at the Haleakala Highway-Kula Highway intersection. This was addressed in the Traffic Impact Analysis Report summarized in and appended to the Draft EA.

Chief Thomas M. Phillips
July 22, 2005
Page 2

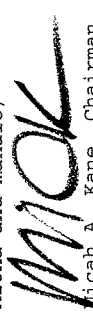


JUL 28 2005
HONOLULU, HI

3. We understand that Maui Land and Pineapple (ML&P) has cancelled the proposed Upcountry Town Center project, and in the meantime, the anticipated traffic on Makawao Avenue at the Old Haleakala Highway and Haleakala Highway By-pass intersections should be lessened. We also understand that ML&P will likely develop this property in the future. At that time, ML&P will be required to identify project-related traffic impacts and propose mitigation measures to minimize traffic in the area.
4. Roadways within the Waiohuli Homestead Community will be approximately 40 to 50 feet wide and will accommodate Fire Department equipment.
5. The discussion on Police Protection in the Final EA will be updated to include the information you provided in your letter.
6. We acknowledge your statement that Kula Highway appears to have sufficient sight-distance for vehicle safety. Since none of the proposed residential lots will abut Kula Highway, there will be adequate space to allow future widening of this roadway.

Thank you again for your participation in the Environmental Assessment process. If you have any questions regarding this project, please call Darrell Ing of our Land Development Division at 586-3844.

Aloha and mahalo,


Micah A. Kane, Chairman
Hawaiian Homes Commission

c: Anson Murayama, Community Planning and Engineering, Inc.
Lacey Kazama, PBR HAWAII

June 7, 2005

Ms. Lacey Kazama
PBR Hawaii
ASB Tower, Suite 650
1001 Bishop Street
Honolulu, HI 96813

Dear Ms. Kazama:

Subject: Waiohuli Homestead Community --
Waiohuli, Kula, Maui, Hawaii
TMK: (2)-2-002:014(portion) and 055(portion)

Thank you for allowing us to comment on the Draft Environmental Assessment (EA) for the subject project, which was received on June 3, 2005.

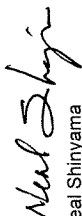
In reviewing our records and the information received, Maui Electric Company (MECO) will be requiring access and electrical easements for our facilities to serve the subject project site. We highly encourage the customer's electrical consultant to submit electrical drawings and a project time schedule as soon as practical so that service can be provided on a timely basis.

We would also like to clarify statements made in Section 6.6 - Electrical and Communication Facilities, page 65 and page 66. The Net Normal Top Load of MECO's peak demand is 225.57 megawatts (MW). This capacity is divided between Maalea Power Plant with 193.24 MW and Kahului Power Plant with 32.33 MW. Additional electrical power from the Hawaiian Commercial & Sugar Company (HC&S) supplements the total capacity for MECO. Although HC&S (Puunene Mill) generates approximately 44 megawatts of electrical power, only 12 megawatts is supplied to MECO per a power purchase agreement under normal conditions. These values are not "reserve capacity" as stated.

The existing Dr-HL Keokea and Waiohuli Subdivision is currently served by a 12.47-kilovolt (KV) line from our Kula Substation and not from our 23-kV line as mentioned. Since this substation is nearly filled to capacity, the addition of this project's anticipated electrical load demand will have a substantial impact to our system. Therefore, in addition to a electrical line extension, other upgrades will be necessary to accommodate a project of this magnitude.

Should you have any questions or concerns, please call Ray Okazaki at 871-2340.

Sincerely,


Neal Shinyama
Manager, Engineering

NS/ro:lh

cc: Office of Environmental Quality Control
Darrell Ing - Department of Hawaiian Home Lands

LINDA LINGLE
GOVERNOR
STATE OF HAWAII



STATE OF HAWAII
DEPARTMENT OF HAWAIIAN HOME LANDS

P.O. BOX 1879
HONOLULU, HAWAII 96805

MICHAEL A. KANE
CHAIRMAN
HAWAIIAN HOMES COMMISSION
BEN HENDERSON
DEPUTY TO THE CHAIRMAN
KAULANA R. PARK
EXECUTIVE ASSISTANT

July 27, 2005

Mr. Neal Shinyama, Manager
Maui Electric Company, Ltd.
Engineering Department
P.O. Box 398
Kahului, Maui, Hawaii 96733-6898

Attn: Mr. Ray Okazaki

Dear Mr. Shinyama:

SUBJECT: Department of Hawaiian Home Lands (DHHL) Waiohuli
Homestead Community Final Environmental Assessment
/Finding of No Significant Impact (FONSI)

Thank you for your letter dated June 7, 2005. We offer the following responses to your comments.

1. We understand that MECO will require access and electrical easements for its facilities to serve the project. The electrical consultant shall submit electrical drawings and a project schedule as soon as practical.

2. We greatly appreciate the information you provided and will revise the EA accordingly. Section 6.6 of the Final Environmental Assessment will include the following:

The proposed project site currently has no electrical service. Electrical power on Maui is provided by Maui Electric Company, Ltd. (MECO). The Net Normal Top Load of MECO's peak demand is 225.57 megawatts (MW). This capacity is divided between Maalaea Power Plant with 193.24 MW and Kahului Power Plant with 32.33 MW. Additional electrical power from the Hawaiian Commercial & Sugar Company (HC&S) supplements the total capacity for MECO. Although HC&S (Puunene Mill) generates approximately 44 MW of




Mr. Neal Shinyama, Manager
July 22, 2005
Page 2

electrical power, only 12 MW are supplied to MECO per a power purchase agreement under normal conditions.

Electrical facilities will be installed to provide electricity for the Waiohuli Homestead Community. Electrical service will be provided by MECO. The existing DHHL Keokea and Waiohuli Subdivision is currently served by a 12.47-kilovolt (kV) line from MECO's Kula Substation. According to MECO, this substation is nearly filled to capacity and the addition of the project's anticipated electrical load demand will impact its system. An electrical line extension and other upgrades will be necessary to accommodate this project.

Thank you again for your participation in the Environmental Assessment process. If you have any questions regarding this project, please call Darrell Ing of our Land Development Division at 586-3844.

Aloha and mahalo,


Micah A. Kane, Chairman
Hawaiian Homes Commission

c: Anson Murayama, Community Planning and Engineering, Inc.
Lacey Kazama, PBR HAWAII

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WAIOHULI HOMESTEAD COMMUNITY
FINAL ENVIRONMENTAL ASSESSMENT/FINDING OF NO SIGNIFICANT IMPACT

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WAIIOHULI HOMESTEAD COMMUNITY
FINAL ENVIRONMENTAL ASSESSMENT/FINDING OF NO SIGNIFICANT IMPACT

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Appendix A

DECLARATION OF EXEMPTIONS LETTER



LINDA LINGLE
GOVERNOR
STATE OF HAWAII

STATE OF HAWAII
DEPARTMENT OF HAWAIIAN HOME LANDS

P.O. BOX 1879
HONOLULU, HAWAII 96808

March 31, 2005

Mr. Lance Nakamura
Development Services Administration
Department of Public Works
and Environmental Management
County of Maui
250 South High Street
Wailuku, Hawaii 96793

Dear Mr. Nakamura:

Subject: Declaration of Exemptions
Keokea-Waiohuli Development
Tax Map Key: (2) 2-2-02:14, 55 and 71

Under provisions of the Hawaiian Homes Commission Act (HHCA) of 1920, as amended, the Department of Hawaiian Home Lands (DHHL) is exempting itself from various State of Hawaii and County of Maui subdivision development related statutes and regulations related to the development of the above-mentioned project.

The subdivision is situated on lands designated for Agricultural zoning (County of Maui, Maui County Code Section 19.30A). However, the subdivision shall be designed and reviewed in accordance with Rural Zoning standards of the Maui County Code, Section 19.29.020. Minimum lot areas shall be 20,000 square feet.

The declaration of exemptions listed below is intended to facilitate the granting of final subdivision approval to allow for the construction of houses prior to the full construction and completion of the subdivision and to minimize the cost of improvements.

These exemptions will not substantially endanger human health or safety and are in the public's interest. Compliance with those sections of the Maui County Code that this project is being exempted from would produce serious hardship without equal or greater benefit to the lessees or the public.

Exemptions from the following State of Hawaii and County of Maui subdivision statutes and regulations are being declared.

MICHAEL A. KANE
GOVERNOR
STATE OF HAWAII
DEPARTMENT OF HAWAIIAN HOME LANDS
P.O. BOX 1879
HONOLULU, HAWAII 96808
KULANA K. KANE
EXECUTIVE ASSISTANT

Mr. Lance Nakamura
March 31, 2005
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1. **State Land Use Commission District Boundary**
 - Chapter 205, Hawaii Revised Statutes, as Amended
 - State Land Use Commission Rules
2. **Title 19, Zoning: Maui County Code, 1980, as Amended**
 - Chapter 19.02, Regulations Generally
 - Chapter 19.06, Districts and Boundaries
 - Chapter 19.510, Application and Procedures
3. **Community Plan**
 - Maui County Code, Chapter 2.80
 - Maui County Charter, Sections 8-8.4 and 8-8.5
4. **Parks Dedication**
 - Maui County Code, Section 18.16.320B
5. **Street Tree Planting**
 - Maui County Code, Section 12.24A.070
6. **Subdivision Filing Fee**
 - Maui County Code, Chapter 18.24
7. **Subdivision Design Standards**
 - Maui County Code 18.20.070, Sidewalks
 - Maui County Code 18.20.080, Curbs and Gutters
 - Maui County Code 18.20.140B, Underground Utilities
8. **Subdivision Design Standards**
 - Maui County Code 19.04.040, Minimum Distance Between Flag Lots
 - Maui County Code 19.08.040, Minimum Lot Width and Area
9. **Subdivision Design Standards**
 - Maui County Code 18.16.130, Minimum Cul-De-Sac Length and Lots Served
 - Maui County Code 18.16.220, Minimum Lot Width for All Corner Lots
10. **Title 18, Subdivisions: Maui County Code**

It is DHHL's intent to obtain final subdivision approval prior to completion of construction in accordance with Maui County Code Section 18.20.190. DHHL, however, is exempting itself from

Mr. Lance Nakamura
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Articles 18.20.200, 18.20.210, 18.20.220, 18.20.230, 18.20.260, and 18.20.270 of the Subdivision Code which requires DHHL to enter into an agreement with the County of Maui to complete the improvements and install utilities and to further provide a surety bond or other security acceptable to the County of Maui to guarantee that improvements and utilities will be completed. DHHL shall complete all improvements and install utilities in accordance with the construction plans approved by the County of Maui.

11. Final Plat


- . Maui County Code 18.12.040, Tax Clearance Certification
- . Maui County Code 18.12.060, Filing for Extensions of Preliminary Plan Action for Final Subdivision Approval

12. Dedication of Roadways and Improvements Solely for Maintenance Purposes, Section 18.40.040 of the Subdivision Code for Acceptance Guidelines

The HHCA mandates that the County maintain the roadways on Hawaiian home lands. DHHL will work with the County to ensure the acceptability of the roadways and improvements. Although dedication of the land may be desirable, DHHL is prohibited from alienating Hawaiian home lands and must retain ownership.

Thank you for your kokua. Should you have any questions, please call Stewart Matsunaga, Project Manager, Land Development Division, at 587-6454.

Aloha and mahalo.


Micah A. Kane, Chairman
Hawaiian Homes Commission

C: Community Planning and Engineering



Appendix B

PRELIMINARY DRAINAGE REPORT

Drainage Report
Keokea-Waiohuli Development
Kula, Maui, Hawaii
Tax Map Key: (2) 2-2-02: 14, 55, & 71

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Prepared For
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Department of Hawaiian Home Lands
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May 2005

Section 1 Purpose of Report

The purpose of this report is to provide storm drainage information for the Keokea-Waiohuli development located in Kula, Maui for the Department of Hawaiian Home Lands (DHHL). See EXHIBIT 1 – LOCATION MAP.

This report will serve as the basis for implementing storm drainage system improvements for the proposed development as shown on the proposed subdivision layout by Community Planning and Engineering, Inc. Refer to EXHIBIT 2 – PROPOSED DEVELOPMENT PLAN.

Section 2 Project Description

2.1 Background

The Keokea-Waiohuli development will provide agricultural and residential house lots to eligible native Hawaiians, in keeping with provisions of the Hawaiian Homes Commission Acts of 1920.

The DHHL property encompasses a total area of 5444.1 acres. The development of 402 acres will include 69 agricultural 2-acre lots and 337 residential 20,000 square foot minimum lots, along with paved 40- and 50- foot roadways. The remaining undeveloped 5042.1 acres will consist of two large remainder lots on Parcel 14, three remainder lots on Parcel 55, and four historic preserve lots. Refer to EXHIBIT 2 – PROPOSED DEVELOPMENT PLAN.

The project involves improvements that include a storm drainage system, potable water system, overhead electric and lighting system, underground communication system, and road connections to Kula Highway. Individual lot developments such as grading improvements, house construction, and waste disposal systems will be the responsibility of individual Homesteaders.

2.2 General Location

The proposed development is located on the makai side of Kula Highway, approximately 3.6 miles southwest of the Kula post office. The development is situated 9 miles from Pukalani town and 16.5 miles from the Kahului airport.

The surrounding area is sparsely populated. Low-density rural residential properties, small farms, and land utilized for agricultural cultivation and ranch type activities characterize the land uses in the vicinity of the project.

2.3 Topography

The project site is located on the steep mountain side of Mount Haleakala which slopes from east to west. The terrain is irregular with existing drainage channels converging, diverging and disappearing sporadically throughout the project site. Existing elevations within the project site range from 2940 feet to 2270 feet.

2.4 Soils

The "Soil Survey of Islands of Kauai, Oahu, Maui, Molokai, and Lanai, State of Hawaii" prepared by the Soil Conservation Service (SCS), dated 1972 was used to identify the soils located within the proposed development. There are four classifications of soils—the Kaimu Series, the Kula Series, the Kamaole Series, and the Keahua Series. Refer to EXHIBIT 2 – SOILS MAP.

- 1) The **Kaimu Series** consists of very well-drained, shallow soils on the uplands of Maui. Permeability is very rapid, due to a substratum of being A'a lava, which consists of many voids and cracks. Runoff over this particular soil is very slow and erosion hazard is only slight.
- 2) The **Kula series** is another prominent soil type found throughout the development site. These soils originated from volcanic ash and are characterized as being well-drained with moderate permeability. The substratum consists of slightly weathered basic igneous rock. The SCS reports runoff to be medium and erosion hazard to be moderate.
- 3) The **Kamaole Series** also consists of well-drained soils that were developed from volcanic ash. The substratum of this soil series is fragmented A'a lava, which possesses a structure that contains many voids. Permeability of this series is moderate and runoff is slow to medium. Erosion hazard is considered slight to moderate.
- 4) The **Keahua Series** is present within the project site is described as well-drained soils found on the uplands of Maui, originating from materials weathered down by igneous rock. The substratum consists of soft, weathered igneous rock. Permeability is reported to be moderate. Runoff is slow and erosion hazard is considered slight.

Table 2.1 – Soils Series

	Description	Substratum	Runoff	Permeability	Erosion Hazard
Kaimu	Well-drained, shallow; located on the uplands of Maui	A'a Lava	Slow	Rapid	Slight
Kula	Well-drained; originated from volcanic ash	Slightly weathered basic igneous rock	Medium	Moderate	Moderate
Kamaole	Well-drained; originated from volcanic ash	Fragmented A'a Lava	Slow to Medium	Moderate	Slight to Moderate
Keahua	Well-drained; originated from igneous rock; located on uplands of Maui	Soft, weathered igneous rock	Slow	Moderate	Slight

2.5 Flood Hazard Zone

According to the County of Maui, Department of Planning, the property is located in Flood Zone C (Minimal Flooding).

Section 3 Storm Drainage Design Criteria

The "Rules for the Design of Storm Drainage Facilities", of the Department of Public Works and Waste Management, County of Maui, dated November 1995, is used to establish design criteria for the development.

3.1 Hydrology

3.1.1 Rational Method

For drainage areas of 100 acres or less, the runoff rate is based on a 1-hour storm with recurrence interval of 10 years or 50 years, where appropriate. The Rational Formula is as follows:

$$Q = CIA$$

where, Q = Storm runoff rate (cfs)

C = Runoff coefficient

I = Rainfall intensity corrected for a duration equal to the time of concentration (T_c)

A = Drainage area (acres)

The runoff coefficients shown below in Table 3.1 were used to determine the runoff for the existing property and for the proposed developments.

Table 3.1 - Runoff Coefficients

Development Type	Description	"C" Value	
		Existing Condition	Developed Condition
Waiohuli Section	20,000 sq. ft. minimum house lots	0.28	0.63
Keokea Section	2 acre agricultural lots	0.28	0.28

Due to the irregular terrain and varying development conditions of the proposed subdivision, a constant runoff rate per acre (CI) for the overall site cannot be determined. Rather, CI changes throughout the entire site, and must be calculated separately for discrete subareas. Refer to appendix for hydrologic calculations.

Table 3.2 shows the equations from Plate 3 of "Rules for the Design of Storm Drainage Facilities" that were used to calculate the runoff time of concentration (T_c) for both existing and developed conditions at Waiohuli and Keokea sections. Note that a T_c value of 5 minutes is substituted for T_c values less than 5 minutes.

Table 3.2 - Time of Concentration (T_c) Equations

Development Type	Description	Plate 3	
		Existing Condition	Developed Condition
Waiohuli Section	20,000 sq. ft. minimum house lots	$T_c=0.0136K^{0.77}$	$T_c=0.0078K^{0.77}$
Keokea Section	2 acre agricultural lots	$T_c=0.0136K^{0.77}$	$T_c=0.0136K^{0.77}$

Rainfall intensity (i) is obtained from Plates 4 and 7 for the 10-year (i = 2.3 inch/hour) and 50-year (i = 2.85 inch/hour) recurrence intervals, respectively.

3.1.2 Natural Resources Conservation Service (NCRS) Method

For drainage areas that consist of subareas totaling more than 100 acres, the "Natural Resources Conservation Service (NCRS) Tabular Hydrograph Method is used to determine the existing overall runoff based on the 100-year, 24-hour design storm. The peak discharge for individual drainage areas of more than 100 acres is based off the 100-year, 24-hour storm using the NRCS Graphical Peak Discharge Method.

To estimate runoff using the NCRS methods, a Runoff Curve Number (CN) was determined. According to the "Erosion and Sediment Control for Hawaii" of SCS, dated March 1981, the minimum CN value is 60. Consequently, any drainage areas with CN values less than 60 were analyzed with a CN of 60.

3.2 Hydraulics

3.2.1 Hydraulic Grade Line Computations

Drain line sizes and gradient are determined using the Manning Formula. For pipe flow or open channel flow,

$$\text{Manning's Formula} \quad V = \frac{1.486}{n} R^{\frac{2}{3}} S^{\frac{1}{2}}$$

using "n" values provided in Table 3.3.

Table 3.3 - Roughness Coefficients

Material	"n" Value
Corrugated Aluminum Pipe	0.024
Earth with vegetation (grassed)	0.035

¹ Formerly known as the Soil Conservation Service (SCS)

3.2.2 Catch Basin Capacity

According to the "Rules Relating to Storm Drainage Standards", set by the Department of Planning and Permitting, City and County of Honolulu, dated January 2000, the inlet capacities for catch basins are as listed in Table 3.4.

Table 3.4 - Catch Basin Capacities

Type	Gutter Grade (%)	Q (cfs)
Standard depressed gutter inlet	0.4	6
	4	4
	Sump	10
Deflector Inlet	4	4.5
	12	5.5
	Greater than 12	6 (max)

The 40- and 50- foot roadways in the subdivision will have no curbs. Therefore, the surface runoff from the lots and road shall not exceed the roadway shoulder swales.

Section 4 Existing Drainage Conditions

For the analysis of the Keokea-Waiohuli subdivision drainage system, the runoff generated from off-site drainage areas mauka of property are assumed to pass through or over the Kula Highway onto the project site. The drainage areas analyzed for the report include both off-site and on-site areas. The area designations and corresponding runoff are shown in EXHIBIT 4 – EXISTING RUNOFF MAP. Hydrologic calculations are enclosed in the Appendix.

Section 5 Proposed Storm Drainage System

5.1 Hydrology

The Keokea-Waiohuli subdivision covers 402 acres of the total 5444.1 acres of DHHL property. The proposed developed area is subdivided into two sections, namely the Keokea and Waiohuli. Keokea is located in the southern portion of the project site. It will comprise of 69 agricultural 2-acre lots, along with a portion of Road "A". The Waiohuli section of the development includes 337 residential 20,000 square foot minimum lots and Roads "A", "D", "E", "F", "G", "G1", "G2", "H", "J", "K", "L", "L1" and "M". The proposed subdivision layout is shown in EXHIBIT 3 - PROPOSED DEVELOPMENT PLAN.

No lot grading will be done for the proposed subdivision. Due to the size of the lot areas and the existing agricultural landscape (primarily pasture or woodland); the anticipated development within Keokea is assumed to increase the runoff by an insignificant amount. Therefore, the runoff for subareas that are 100 acres or less within Keokea is assumed to be constant.

Similar to Keokea, the Waiohuli section is small relative to the overall drainage basin areas that it contributes to. However, the difference between the existing and developed conditions within Waiohuli is assumed to be more dramatic than Keokea, as a result of the smaller residential lots and an increase in paved roadway area. Therefore, the runoff generated from the Waiohuli drainage areas consisting of 100 acres or less were not considered constant from existing to developed conditions.

For the small drainage areas between the Waiohuli roadways, that were not tributary subareas to drainage basins of 100 acres or more, a runoff per acre (CI) was determined based on a time of concentration (T_c) of 5 minutes. The rainfall intensity (i) for the 1-hour, 10-year and 1-hour, 50-year storm was determined to be 5.9 inch/hour and 7.3 inch/hour, respectively. The CI results for the developed conditions for these small drainage areas are as follows:

$$CI(10) = 0.63 \times (5.9 \text{ in/hr}) = 3.72 \text{ cfs/acre and}$$

$$CI(50) = 0.63 \times (7.3 \text{ in/hr}) = 4.60 \text{ cfs/acre.}$$

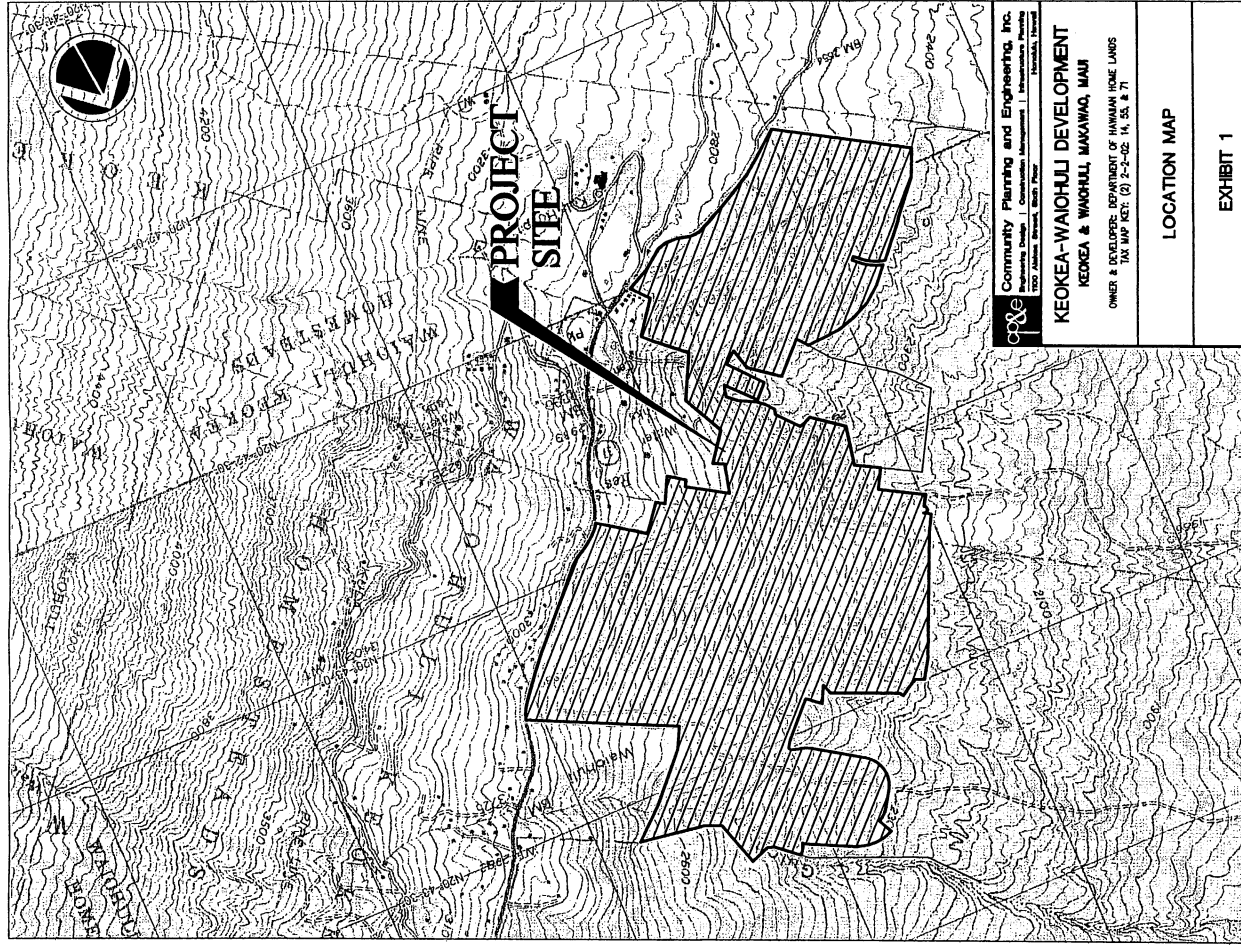
5.2 Hydraulics

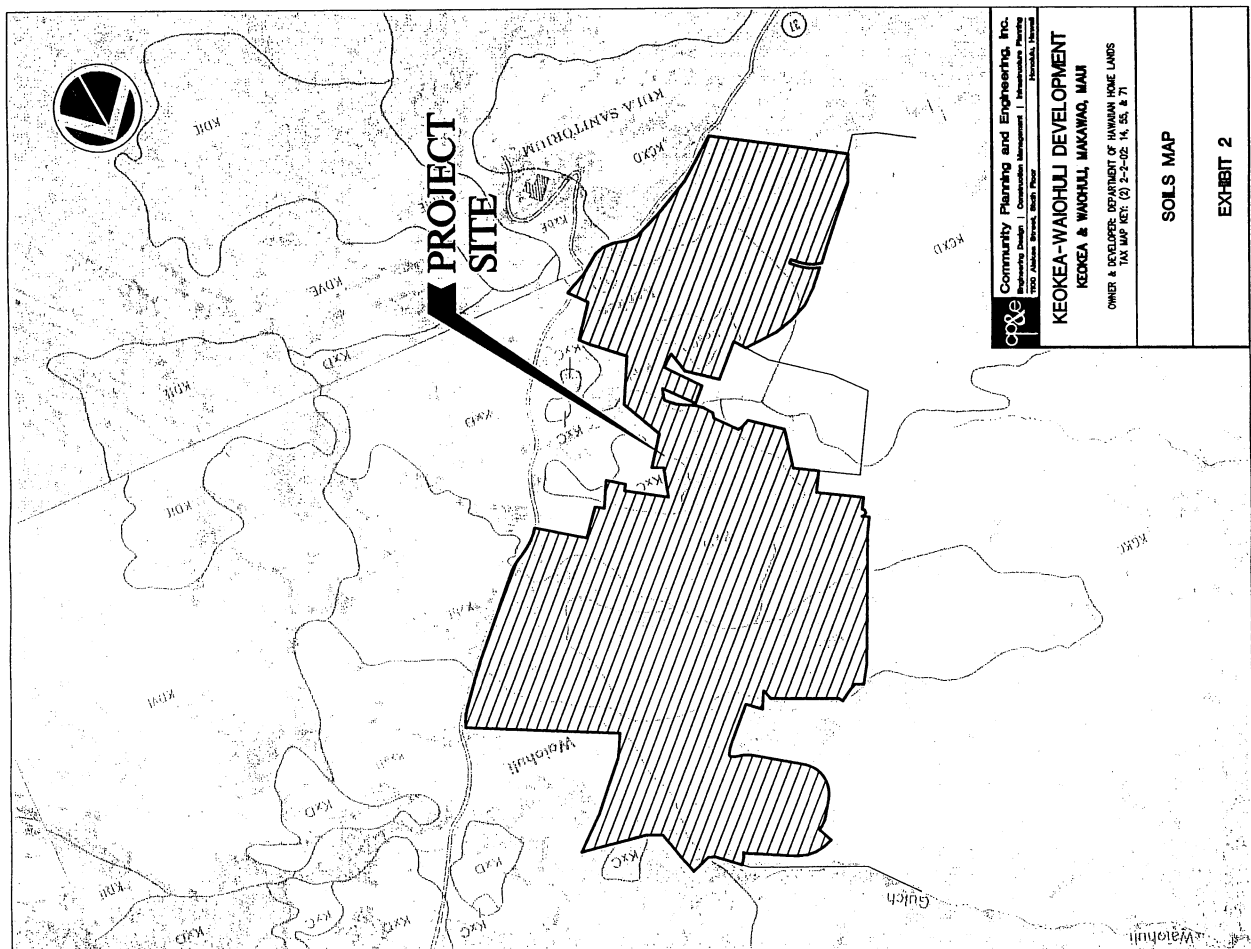
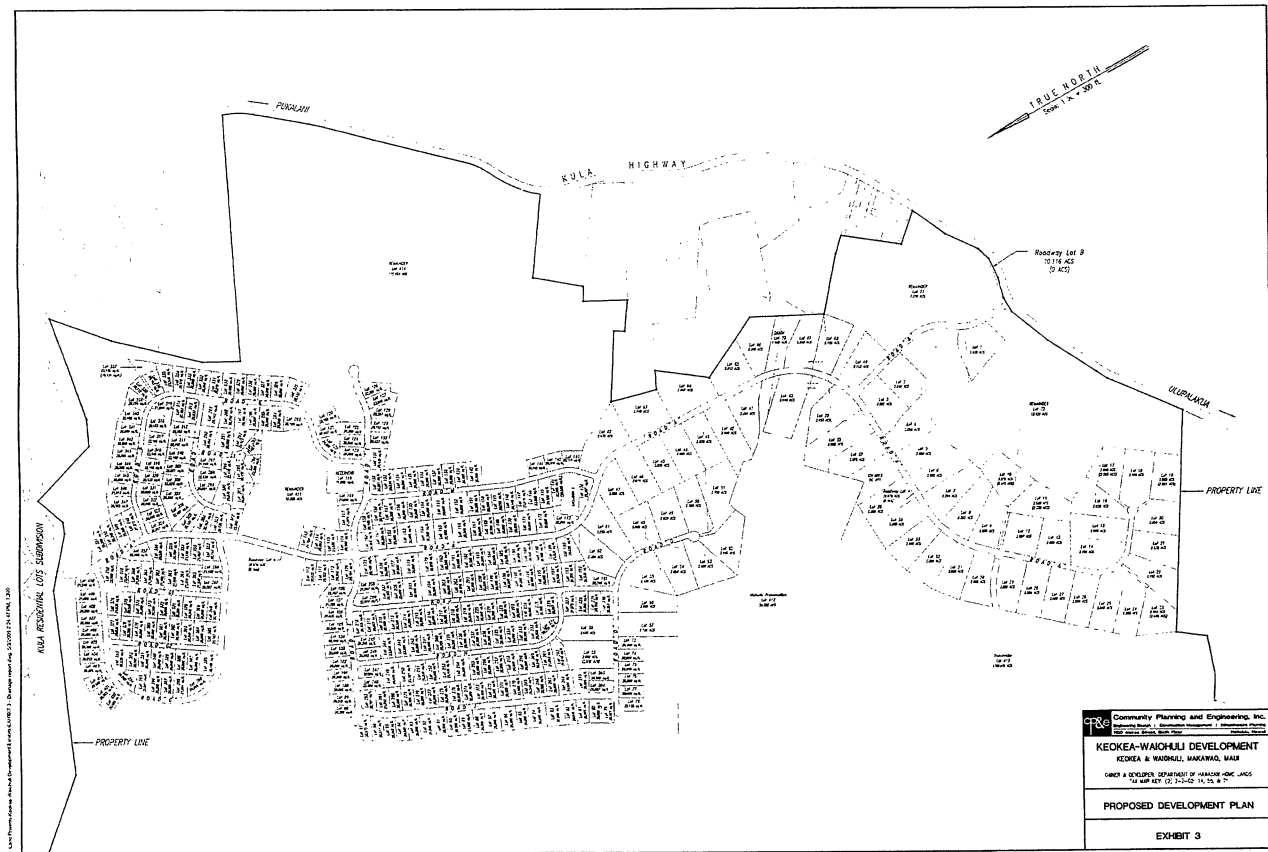
The proposed drainage system will include culverts, catch basins, drain lines, drain manholes, and roadway swales. Culverts will be placed where the roadways may obstruct any existing streams. For streams generated from drainage basins greater than 100 acres, culverts are designed to handle the 24-hour, 100-year storm. To pass through off-site and on-site runoff from drainage areas 100 acres or less, the culvert design is based on the 1-hour, 50-year storm. Refer to appendix for hydraulic calculations.

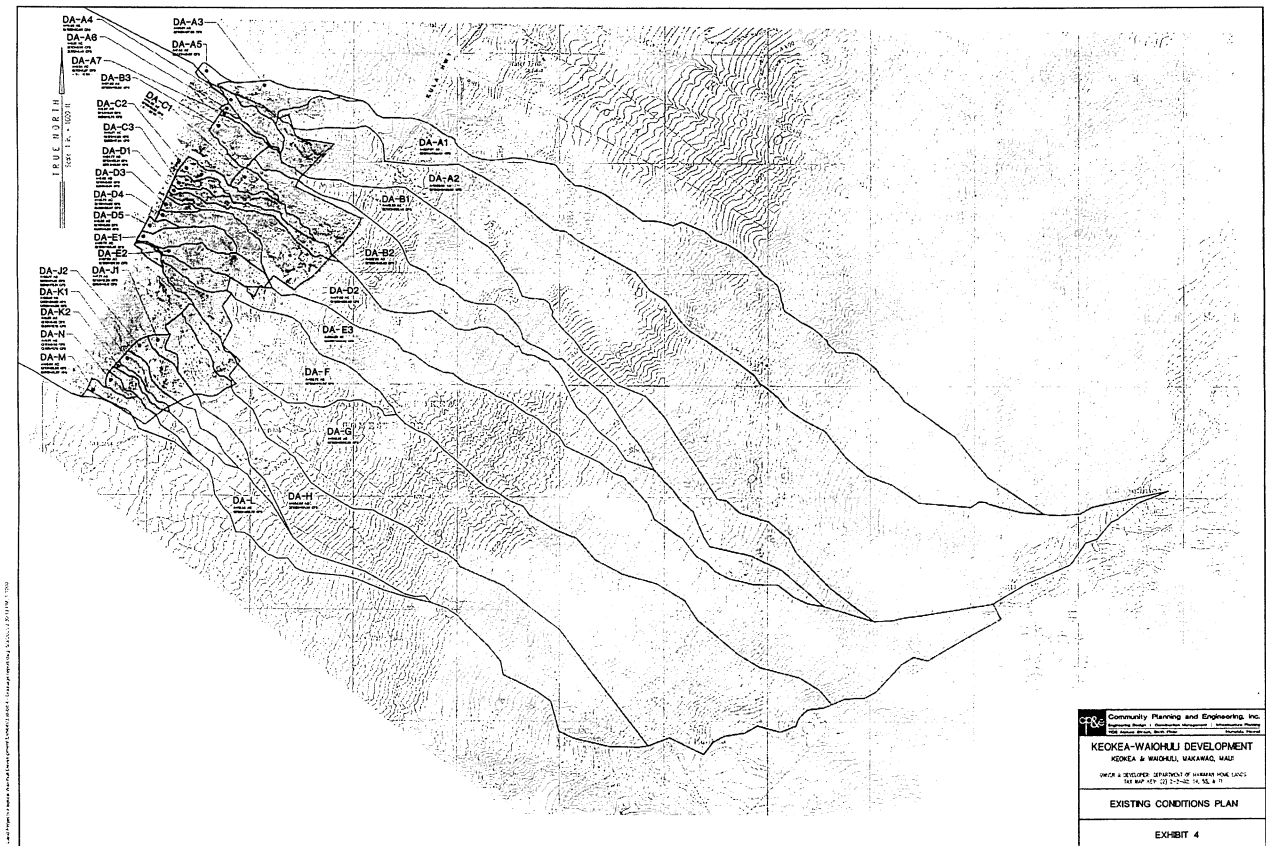
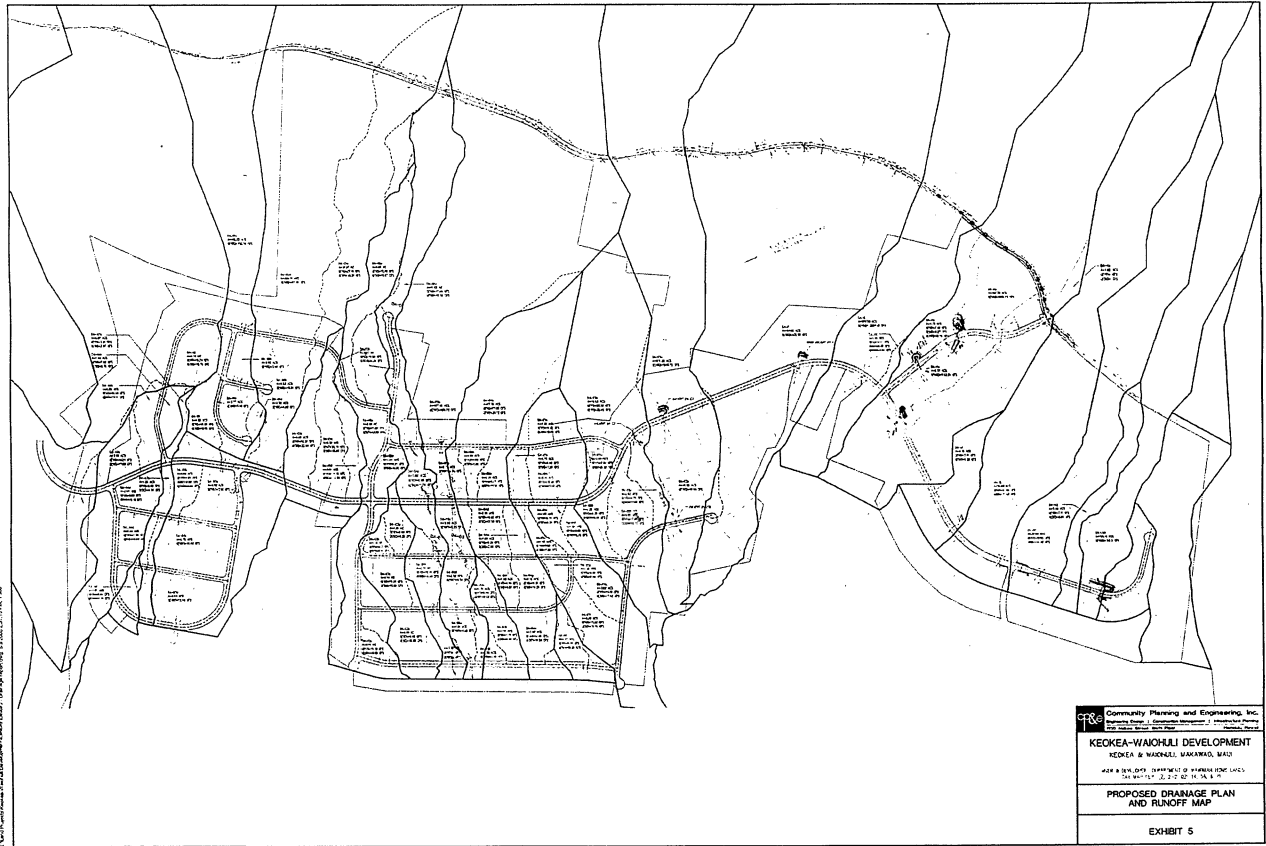
Surface runoff flowing onto the roadway will be channeled to a catch basin or culvert crossing location by roadway concrete swales. Catch basins are spaced to prevent the runoff within a swale from overflowing onto the paved roadway. The swale design capacity is based on the 1-hour, 10-year storm except in sump condition, where the 1-hour, 50-year storm is used.

Section 6 References

1. City and County of Honolulu, Department of Public Works, Division of Engineering, "Storm Drainage Standards", March 1969.
2. County of Maui, "Title MC-15, Department of Public Works and Waste Management, Chapter 4, Rules for the Design of Storm Drainage Facilities in the County of Maui, "Wailuku, Hawaii, November 1995.
3. U.S. Department of Agriculture, Soil Conservation Service, *Erosion and Sediment Control Guide for Hawaii*, Honolulu, Hawaii, March 1981.
4. U.S. Department of Agriculture, Soil Conservation Service, *Soil Survey of Islands of Kauai, Oahu, Maui, Molokai, and Lanai, State of Hawaii*, Washington, D.C., August 1972.
5. U.S. Department of Agriculture, Soil Conservation Service, *Urban Hydrology for Small Watersheds*, Technical Release 55, Second Edition, Washington, D.C., 1962.







APPENDIX

A-1 HYDROLOGY FOR EXISTING CONDITIONS

- A. Drainage Areas (Greater than 100 acres)
 - 1. Drainage Area A
 - 2. Drainage Area B
 - 3. Drainage Area D2
 - 4. Drainage Area E & F
 - 5. Drainage Area G
 - 6. Drainage Area H
 - 7. Drainage Area L
- B. Drainage Areas (100 acres or less)
 - 1. Drainage Area A6
 - 2. Drainage Area A7
 - 3. Drainage Area C1
 - 4. Drainage Area C2
 - 5. Drainage Area C3
 - 6. Drainage Area D1
 - 7. Drainage Area D3
 - 8. Drainage Area D4
 - 9. Drainage Area D5
 - 10. Drainage Area J1
 - 11. Drainage Area J2
 - 12. Drainage Area K1
 - 13. Drainage Area K2
 - 14. Drainage Area M
 - 15. Drainage Area N

A-2 HYDROLOGY FOR DEVELOPED CONDITIONS

A-3 HYDRAULIC COMPUTATIONS

- A. Culvert Hydraulic Computations
- B. Swale Capacity



Appendix C

AVIFAUNAL & FERAL MAMMAL SURVEY

AVIFAUNAL AND FERAL MAMMAL SURVEY OF
DEPARTMENT OF HAWAIIAN HOMELANDS
PROPERTY AT WAIHOHULI, KULA, MAUI

INTRODUCTION

This report provides the findings of a two day (7, 8 July 2004) faunal (bird and mammal) field survey of approximately 400 acres of Department of Hawaiian Homelands property at Waiohuli, Kula, Maui. References to pertinent published and unpublished sources are also included in the report to provide a broader perspective of birds and mammals known from similar habitat on Maui. The goals of the field survey were to:

- 1- Document the species of birds and mammals presently found on the property.
- 2- Determine a relative abundance estimate at this location for all species of birds found on the survey.
- 3- Conduct an evening search for the endangered Hawaiian Hoary Bat (*Lasiurus cinereus semotus*).
- 4- Investigate all the habitats on the property and note any resources important to native birds and mammals as well as migratory birds.

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12 July 2004

GENERAL SITE DESCRIPTION

The property contains a variety of habitats from pastures to second growth forest with a thick understory of brush. The upper portion of the property at 3000 feet elevation is relatively wet with lush vegetation. The property continues down slope into drier scrub lands. Department of Hawaiian Homelands Kula Lots 1 and 2 form the eastern boundary while ranch lands occur to the west. No wetland habitat was found on

the survey. Some native vegetation was seen but the majority of the plants were alien species.

SURVEY PROTOCOL

The faunal survey was conducted on foot by walking existing ranch roads and where possible into the patches of dense second growth forest. At random locations throughout the property and in all habitat types census stations were established where all birds seen or heard over an eight minute time period were tallied. These data were used to determine a relative abundance estimate for each species. Less common birds seen between the census stations were also counted. Data were collected during early morning and late afternoon periods when birds were most active and detectable. Mammal data were collected by visual observations and evidence in the form of tracks. No trapping was conducted to determine relative abundance of mammals. Such an effort was not possible nor necessary given the scope and time constraints of this survey. The evening of 7 July was used to search for the presence of the endangered Hawaiian Hoary Bat. A Pettersson Elektronik AB Ultrasound Detector D 100 was used to listen for echolocating bats.

Weather during the survey period varied from clear mornings to partly cloudy afternoons. This weather pattern is typical of the Kula area. Winds were light which

made the detection of vocalizing birds easy. The census stations were more than 250 m apart to overcome the potential problem of double counting birds.

Scientific and common names used in this report follow Pyle (2002) and Honacki et al. (1982). These sources use the names found in the current scientific literature.

RESULTS OF THE FIELD SURVEY

Native Land Birds:

No native land birds were recorded on the survey. Given the location and available habitats the only native land bird likely to occur in this area is the Hawaiian Owl or Pueo (*Asio flammeus sandwichensis*). This is a subspecies of the Short-eared owl. The Pueo is listed as endangered on Oahu by the State of Hawaii. They are day active rather than night active owls like the alien Barn Owl (*Tyto alba*). Pueo forage in agricultural and ranch lands as well as native forest. They nest on the ground despite the challenges of ground predators (Hawaii Audubon Society 1997). Pueo are frequently seen on the upper slopes of Haleakala ranch lands (pers. observations).

Native Waterbirds:

No native waterbirds were seen or expected due to the absence of wetland habitat on this property.

Seabirds:

No seabirds were observed on the survey. None would be expected to nest at this location (Hawaii Audubon Society 1997, Harrison 1990). The endangered Dark-rumped Petrel or Ua'a (*Pterodroma phaeopygia sandwichensis*) nests at much higher elevation on Haleakala. They may fly over the property on their way back and forth to the sea.

Migratory Shorebirds:

No migratory shorebirds were tallied on the survey. This was to be expected since these birds are on their breeding grounds in the arctic at this time of year. From August to late April the Pacific Golden-Plover (*Pluvialis fulva*) would be expected to occur in the pastures on this site where they forage for insects. They are territorial while here in Hawaii. This species has been the subject of long term, intensive life history studies both here in Hawaii and in Alaska (Johnson et al. 1981, 1989, 1993, 2001a, 2001b, 2004). The Hawaiian name for this bird is Kolea. They are the most abundant migratory shorebird wintering in Hawaii. This species is not listed as threatened or endangered. No other migratory shorebird would be expected to occur with any frequency on this property.

Alien (Introduced) Birds:

A total of 16 species of non-native alien birds were recorded on the survey. Table One gives the names of these species and relative abundance estimates for each species. A similar array of species were found on surveys of nearby lands (Bruner 1994, 1998). The Java Sparrow (*Padda oryzivora*) is noted by Hawaii Audubon Society (1997) as "recorded on Maui" but this source does not describe its range on the island. I have seen the bird frequently in urban areas at lower elevation on Maui. This is the first time I have seen them at 3000 feet elevation in Kula. None of the alien birds are listed as threatened or endangered.

Mammals:

Four Axis Deer (*Axis axis*) were seen in the early evening hours of 7 July. They are common in this type of habitat on Maui (pers. observations). Two feral pigs (*Sus scrofa*) were also observed on the evening of 7 July along with three feral cats (*Felis catus*). Seven Small Indian Mongoose (*Herpestes auropunctatus*) were tallied over the two day survey. No rats or mice were observed but undoubtedly these mammals occur on the property. None of these alien (introduced, non-native) mammals are listed as threatened or endangered. The only native land mammal in Hawaii is the endangered Hawaiian Hoary Bat (*Lasiurus cinereus semotus*). As noted in the Survey Protocol section of this report an ultrasound detector was used on the evening of 7 July to

listen for the echolocating vocalizations of the Hawaiian Hoary Bat. No bats were detected. This species does occur on Maui but in relatively low numbers (Tomich 1986, Kepler and Scott 1990). They are more abundant on Kauai and the Big Island. This mammal utilizes a wide variety of habitats to forage for flying insects. They can be seen hunting in native forest, agricultural lands, urban areas as well as over bays and ponds. Jacobs (1991, 1993) and Reynolds et al. (1998) have shed new light on the life history of the Big Island population of this species. It is entirely possible that the Hawaiian Hoary Bat forages and perhaps roosts on or near this site. I found one bat on a survey of DHHL Kula Residential Lots (Bruner 1994). Duvall and Duvall (1991) note that the bat is more common on Maui than the reports in the literature would indicate.

SUMMARY AND CONCLUSIONS

The field survey did not find any native or migratory birds. This results was not entirely unexpected given the time of year. Migratory shorebirds are on their arctic breeding grounds from May through July. The only native land bird that might occur in the area is the Pueo (Hawaiian Owl). This bird is listed as endangered on Oahu by the State of Hawaii but not on Maui. All of the mammals recorded were alien species. The endangered Hawaiian Hoary Bat was not found. This likewise was not totally

unexpected. The bat is relatively rare on Maui. It could forage in this area and roost in the trees on the property.

As the site changes from ranch land to residential some alien birds will become more common in this area while others will decline in abundance. This is simply due to the fact that some species prefer more undisturbed habitat (turkeys) while others (Common Mynas) prefer more developed areas. This situation is also true of mammals. Axis Deer seek the shelter of dense brush and trees during the day and would therefore be expected to decline in number at this site if the forested patches are cleared for residential development. The native and endangered Hawaiian Hoary Bat can forage in urban settings as well as in less disturbed habitats.

TABLE ONE

Alien (introduced) birds found on a field survey of DHHL Waiohuli property in Kula, Maui (7-8 July 2004). The relative abundance estimates come from census data taken at randomly selected sites throughout the property. A= Abundant (10+ average per count station); C= Common (5-9 average per count station); U= Uncommon (1-4 average per count station); R= Recorded (total number tallied on survey data)

Common Name	Scientific Name	Relative Abundance
Cattle Egret	<i>Bubulcus ibis</i>	R = 9
Gray Francolin	<i>Francolinus pondicerianus</i>	C
Black Francolin	<i>Francolinus francolinus</i>	C
Ring-necked Pheasant	<i>Phasianus colchicus</i>	U
Wild Turkey	<i>Meleagris gallopavo</i>	R = 16
Spotted Dove	<i>Streptopelia chinensis</i>	U
Zebra Dove	<i>Geopelia striata</i>	A
Sky Lark	<i>Alauda arvensis</i>	C
Japanese White-eye	<i>Zosterops japonicus</i>	A
Northern Mockingbird	<i>Mimus polyglottos</i>	A
Common Myna	<i>Acridotheres tristis</i>	C
Northern Cardinal	<i>Cardinalis cardinalis</i>	C
House Finch	<i>Carpodacus mexicanus</i>	A
African Silverbill	<i>Lonchura cantans</i>	R = 6
Nutmeg Mannikin	<i>Lonchura punctulata</i>	C
Java Sparrow	<i>Padda oryzivora</i>	R = 12

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Appendix D

ARCHAEOLOGICAL INVENTORY SURVEY
OF PROPOSED ROAD CORRIDORS

**WAIHOLI ROAD CORRIDOR SURVEY:
REVISED ARCHAEOLOGICAL INVENTORY SURVEY REPORT FOR
THE DEPARTMENT OF HAWAIIAN HOMELANDS (DHHL)
IN WAIHOLI AHUPUA`A, KULA DISTRICT,
ISLAND OF MAUI, HAWAII
[TMK: 2-2-2: portion of 056]**

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ABSTRACT

Scientific Consultant Services (SCS), Inc. conducted a specific, revised Inventory Survey more fully documenting archaeological sites occurring in proposed road corridors on a c. 400-acre parcel in Waioli Ahupua`a, Kula District, Maui Island, Hawaii (TMK:2-2:056 por.). The subject parcel and many of the adjacent lands are owned by the Department of Hawaiian Home Lands (DHHL).

A total of nine (9) road ways with various designations are planned for construction in this DHHL subdivision. This revised study was limited to survey, mapping and recording, and testing at features within proposed road corridors. A total of eighteen (18) previously identified and recorded archaeological sites occur in the nine road corridors. These sites were recorded during Inventory Survey (Kolb *et al.* 1997). A total of thirty-five (35) newly identified features associated with nine (9) sites were recorded herein. The other nine sites were re-evaluated and in some instances, re-mapped and/or excavated. Newly identified features consisted of enclosures, C-shapes, U-shapes, walls, terraces, mounds, alignments, platforms, lava tubes, rock shelters, and modified outcrops, these respectively related to habitation, agriculture, and boundary functions. One burial was identified during testing. All the features investigated herein are associated with traditional times, no historic sites or artifacts having been recovered during this revised Inventory Survey.

The eighteen (18) sites and component features more fully documented herein had previously been assessed for significance. The significance for these sites has been somewhat revised, based on the information produced during this survey. A total of 11 sites are significant under Criterion D (Site 50-50-10-3221, -3224, -3228, -3246, -3256, -3263, -3268, -3269, -3267, -3274, -3280, one site has been assessed as significant under Criteria D and E (Site -3272), four sites were subject to Data Recovery (Sites -3219, -3223, -3227, -3257) and are assessed elsewhere (Dega *et al.* in preparation), and two sites (Site -3222, -3241) are still not considered significant under any of the criteria, as was initially assessed during Inventory Survey (Kolb *et al.* 1997:D-8, D-9). Preservation of Site -3272, Feature 1 (burial) is recommended and will be discussed in a Burial Treatment Plan for the entire project area. Archaeological Monitoring is recommended for large-scale terrain altering construction of the road ways as inadvertent burials and cultural materials may be identified.

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INTRODUCTION

Scientific Consultant Services (SCS), Inc. conducted a limited, revised Inventory Survey more fully documenting archaeological sites occurring in proposed road corridors on a c. 400-acre parcel in Waiohuli Ahupua'a, Kula District, Maui Island, Hawai'i (TMK-2-2-056 por.) (Figures 1, 2, and 3). The subject parcel and many of the adjacent lands are owned by the Department of Hawaiian Home Lands (DHHL). The current project area (Phase I) represented a portion of a larger area previously subject to Inventory Survey by Kolb *et al.* (1997). In the study, 1,093 features composing 213 sites were recorded during survey of over c. 800 total acres in Waiohuli. This revised Inventory Survey, as well as Data Recovery (Dega *et al.*-in preparation), was only focused on the eastern (*mauka*) 400-acres of the subject parcel (see Figure 2). Many of these sites occur in proposed road corridors. During this revised survey, both previously identified sites and previously undocumented features were documented and subject to various levels of recordation. This report presents the results of the road corridor work.

A total of nine (9) road ways with various designations are planned for construction in this DHHL subdivision (see insert construction map in back of report). The roads are non-consecutively labeled Road A through Road M and form a network through the proposed subdivision. During the present research, each proposed road corridor was staked by professional surveyors and surveyed by an SCS crew. Previously documented sites (Kolb *et al.* 1997) were also re-identified and assessed in the road corridors. The present survey led to the documentation of thirty-five (35) previously unrecorded features associated with nine (9) sites. A total of eighteen (18) sites occur in the various road corridors. Of the nine road corridors, only one (Road M) did not contain sites/features. Figure 3 illustrates the road network and the various sites/features identified in the roads during this survey.

BACKGROUND ARCHAEOLOGY

The Kolb *et al.* (1997) Inventory Survey study was one of five occurring on DHHL parcels in the Kula uplands. Pilot reconnaissance was conducted of the Waiohuli and Keokea area by Riford (1987) under the auspices of the B.P. Bishop Museum. Inventory Survey was conducted on neighboring DHHL Waiohuli I and Keokea parcels by Brown *et al.* (1989). A total of 159 sites were recorded during this more formal research, with 108 sites having been identified in Keokea and 51 occurring in Waiohuli I. Data Recovery was completed at eleven sites on the Waiohuli I parcel by Dunn *et al.* (1999). Data Recovery has recently been completed on the Keokea parcel. Dega *et al.* (2004) documented and tested twenty-one sites on the Keokea landscape. In concert, the five combined phases of reconnaissance, Inventory Survey, and Data

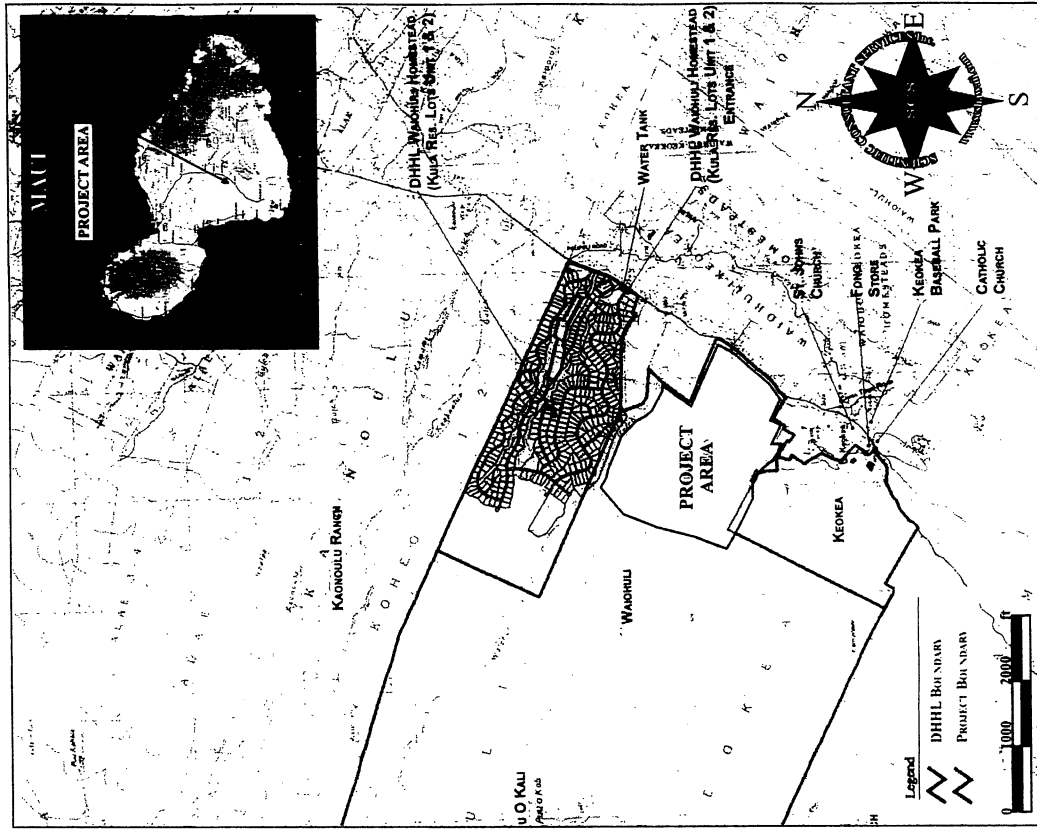
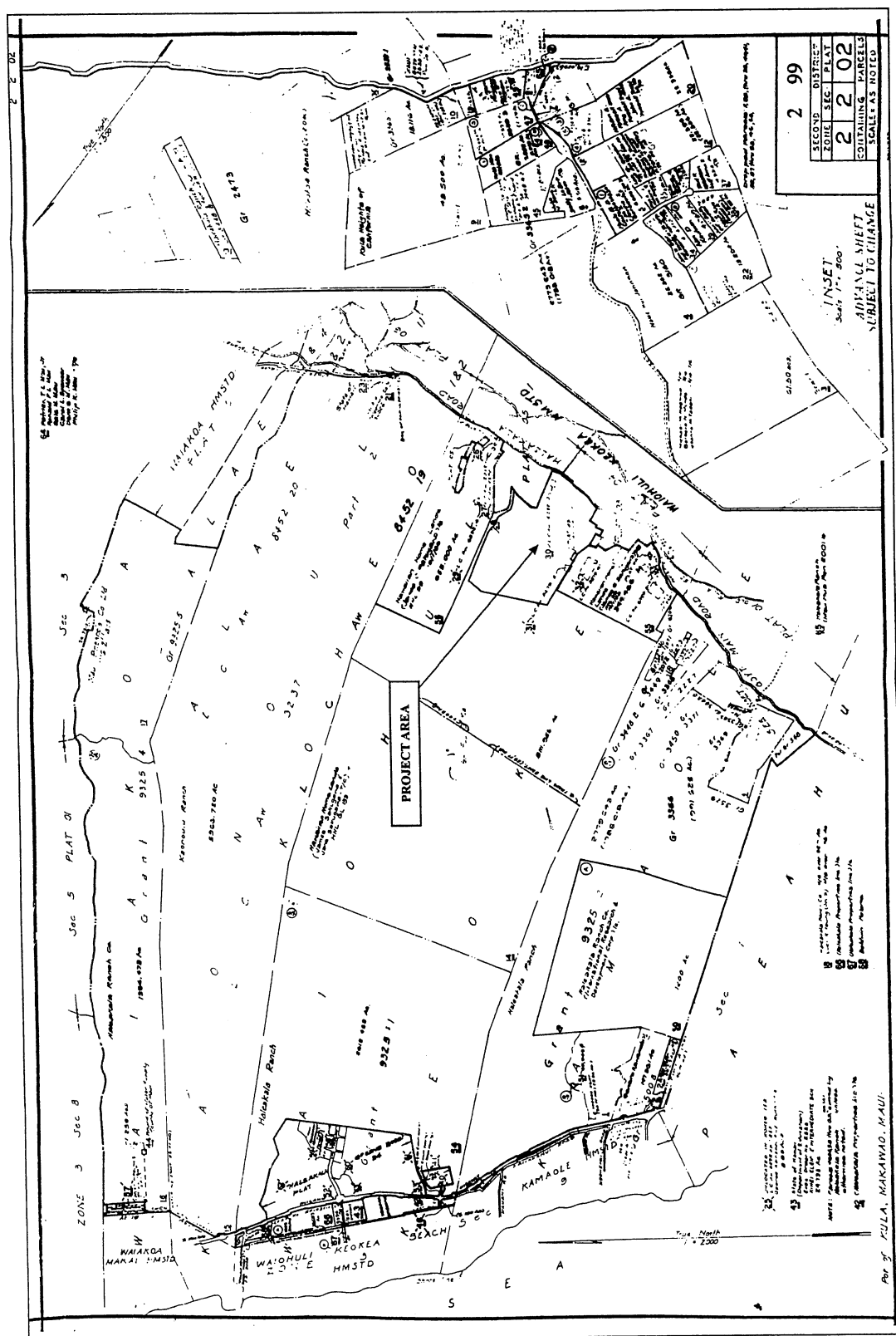


Figure 1: USGS Map Showing Project Area Location.



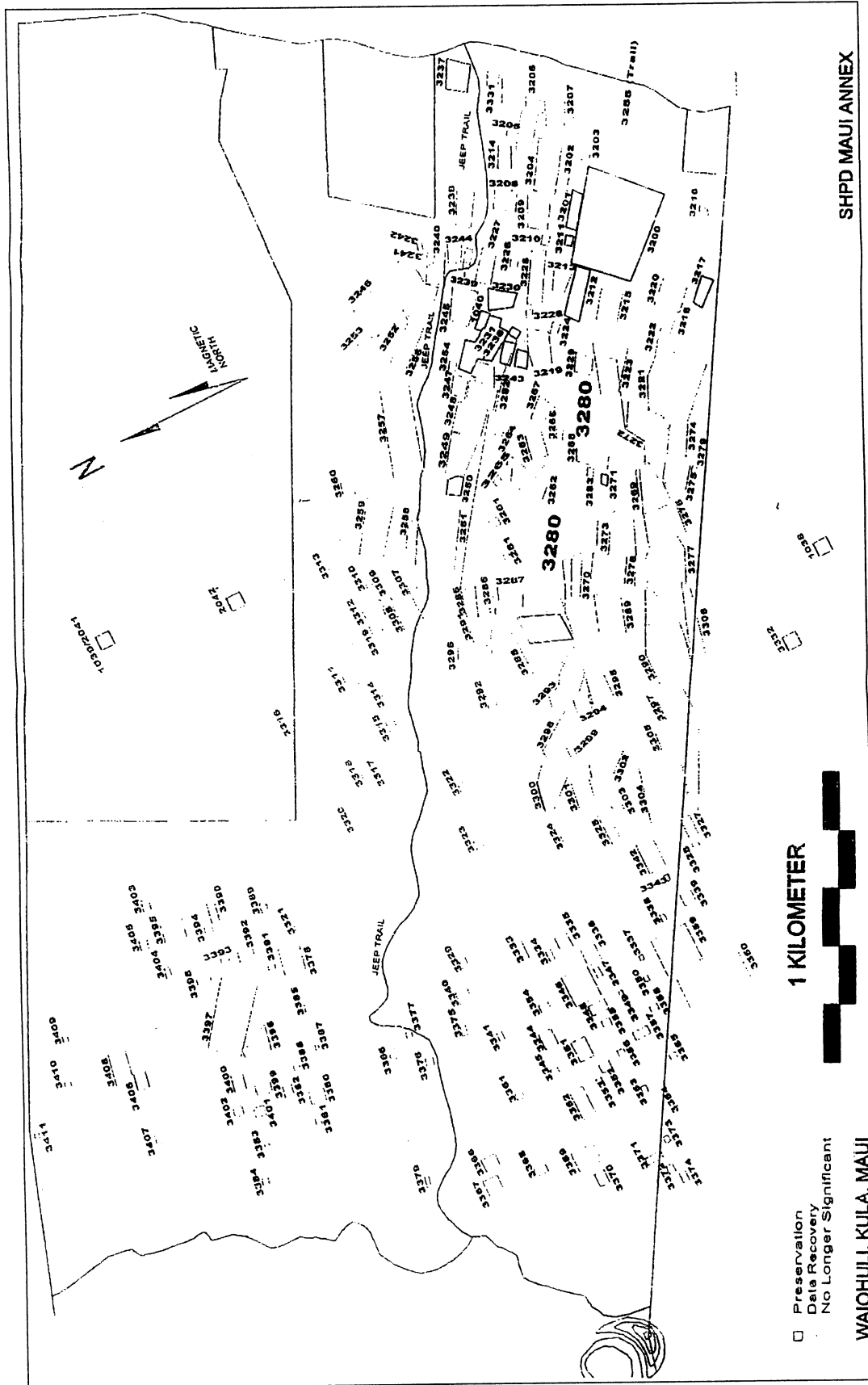


Figure 3: Map of Roadways Planned for Construction (from Kolb et al.).

Recovery have led to documentation of 372 sites with 1,367 component features. Summary results of these studies are presented further below. The present Inventory Survey revision investigations should provide the opportunity to add to this substantial database.

PROJECT AREA

The revised Inventory Survey project area occurs to the immediate south of the developing Waiohuli Unit I (Waiohuli I) residential area and to the immediate north of the soon-to-be-developed Keokea Unit I residential area. These two DHHL parcels form the southern and northern boundaries of the present project area surveyed by Kolb *et al.* (1997). The present study area is redundant to the Data Recovery area (see Dega 2004 Data Recovery Plan) and is occasionally referred to in this document as "southern Waiohuli". This section composes the eastern c. 400-acres of the larger property. The *maka*i or western extent occurs at approximately the medial section of the Waiohuli Unit I development (see Figures 1 and 2). The western boundary is defined by Kula Highway.

The current overall project area composes the southern extent of Waiohuli Ahupua'a at an elevation between c. 2200-3000 feet above mean sea level (amsl.). The terrain is one of sloped plains interposed with lava outcrops, ridges, swales, and non-perennial gulches, the latter being Waiohuli Gulch that courses through the northern boundary of the present project area (Figures 4, 5, and 6). The slope gradients are variable throughout the project area. As such, road planning has been based primarily on topographic accessibility and the presence/absence of significant archaeological sites. As gleaned from former excavation work in the Kula area, soils generally consist of developed volcanic ash and 'a' lava which have predominantly formed shallow soils consisting of silty clay and silty clay loams (see Kolb *et al.* 1997 and Dega *et al.* 2004). This portion of Kula is extremely arid and no perennial streams course through the Waiohuli and Keokea project areas. With annual rainfall being only c. 400 millimeters (about 16 inches) for these upland parcels, the notion that intensive agricultural was probably practiced here for over 700 years certainly encourages the imagination. Yet, this is to under-estimate the amount of fog drip created in this environment that made agricultural not only possible, but successful (see Dega *et al.* 2004; Kirch 2000). The multitude of agricultural loci across the parcel, from small terraces in swales to gigantic garden enclosures on modest hill slopes, some measuring 14 acres or more, attest to the dependence on fog drip and the success of adapting with this commodity.

Vegetation within the project area is dominated by introduced species and "bears no resemblance to what it may have looked like during the pre-contact era. The deforestation of the

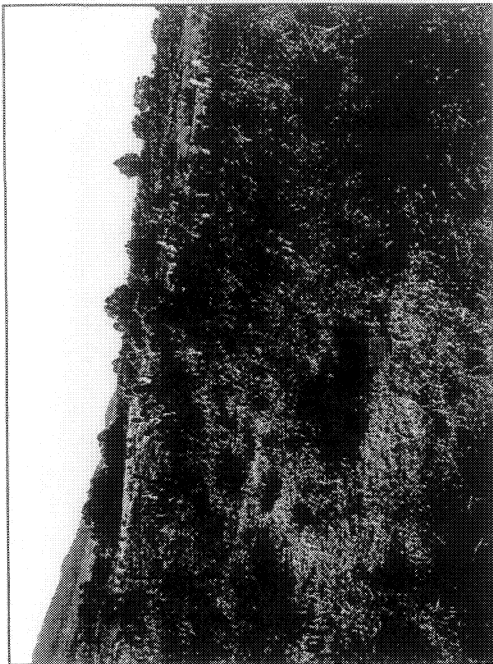


Figure 4: Project Area Landscape Overview.

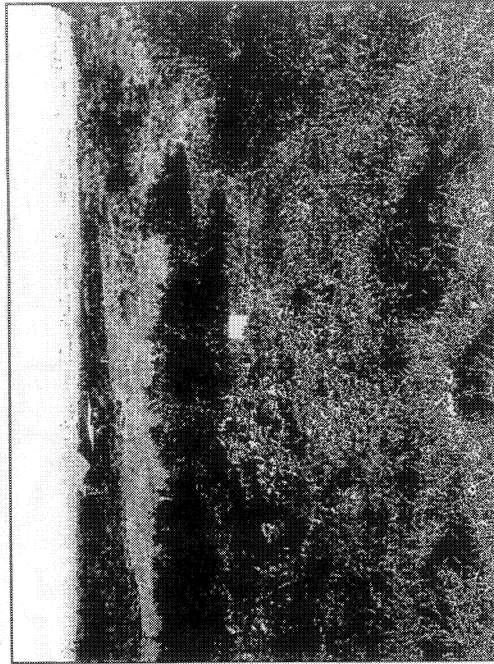


Figure 5: Project Area Landscape Overview.

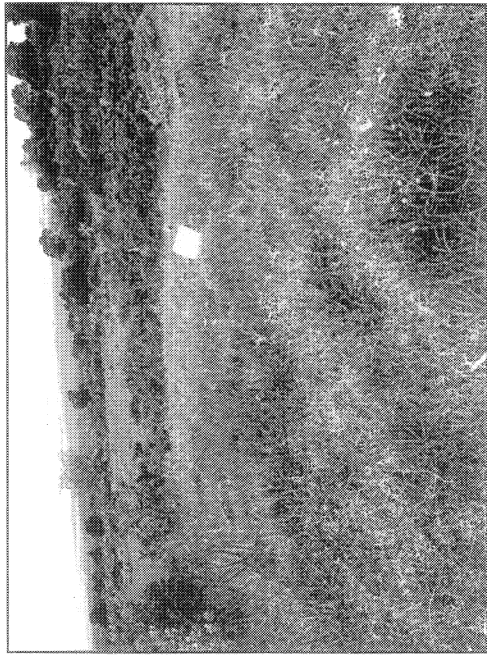


Figure 6: Overview of Project Area Landform.

native forest to create arable land for agricultural fields and habitations, in addition to post-contact ranching, logging activities, and modern development has no doubt changed the landscape of Kula into an area inhabited by evasive (historically introduced) plants" (Kolb *et al.* 1997:265). These evasive plants include massive stands of lantana (*Lantana camara*), black wattle (*Acacia decurans*), Christmas Berry (*Schinus terebinthifolius*), *panini* or prickly pear cactus (*Opuntia megacantha*), and various grasses and secondary growth shrubs, among others. Late Summer or early Fall is the best time frame which to identify or observe sites in the project area as in the Spring and early Summer, higher rainfall in the winter months has allowed these plants to thrive and effectively mask the sites under vegetation.

WAOIHULI-KEOKEA ARCHAEOLOGICAL SUMMARY

The corpus of literature regarding upland Kula settlement patterns has grown exponentially in the past several years through the combination of data from one pilot reconnaissance (Riford 1987), two Inventory Survey projects (Brown *et al.* 1989, Kolb *et al.* 1997), and two Data Recovery projects (Dunn *et al.* 1999, Dega *et al.* 2004) recently having been conducted in Waiohuli and Keokea. This emergent body of data allows for synthesizing salient settlement and land use patterns directly pertinent to the project area. This brief summation section is simply intended to provide brief background to the road survey work results.

The archaeological studies conducted by Brown *et al.* (1989), Kolb *et al.* (1997), Dunn *et al.* (1999), and Dega *et al.* (2004) in Waiohuli and Keokea have led to some significant interpretations of upland settlement through time, and at the same token, have also been unsuccessful in addressing several important research questions driving the respective projects.

The majority of information gleaned to date suggests that only a sparse population exploited the upland landscape prior to the A.D. 1400s, this small population later having been drawn into the upland population movement occurring during the A.D. 1400-1600 range. The population of Keokea and the southern Waiohuli area (the study area of Kolb *et al.* 1997) appears to have stabilized through the late 1700s. Depopulation is suggested for the early portion of the 19th century when archaeological evidence for continued permanent occupation of Keokea-southern Waiohuli is virtually non-existent (although Kolb *et al.* 1997:205-206 note possible re-population of the area by A.D. 1900). In essence, the studies show that there appears to be gradual and continuous permanent settlement of the area from the A.D. 1400s followed some 400 years later by a fairly abrupt decline in population and abandonment of the area. However, an alternative dataset from the northern Waiohuli project area (that of Dunn *et al.* 1999) shows permanent upland habitation occurring primarily from the A.D. 1600s, with only a very few number of sites inferred to have been constructed and occupied prior to the A.D. 1600s. None of the northern Waiohuli Ahupua'a sample sites were occupied prior to the 1400s.

At this juncture, there is only scant hard evidence from all the combined projects to suggest differences between households of chiefs and those of commoners. The chiefs, if any occupied the area, were certainly lesser chiefs, with a majority of the population being *maka ainana* living in 2-3 structure clusters. Some sites do contain up to five and six structures, implying some form of social differentiation, yet the information has been inconclusive that these structures were indeed occupied by higher status individuals. Permanent habitation architecture itself across the area is fairly homogeneous, with no one trait of "form and fit" strategy truly dominating another. The standardization in prehistoric upland construction implies a similar resource base for construction material procurement and the timing of construction implies a fairly harmonized settlement from the A.D. 1400s.

Agricultural pursuits appear to have flourished in association with habitation; the symbiotic relationship appears inevitable. A majority of the data show that prior to the A.D. 1400s, only small terraces were identified in terms of formalized architectural structures. The terraces grew and expanded with population increases in the A.D. 1400-1600 interim and rapidly expanded in size and number from the A.D. 1600s. Agricultural site construction decreased

concomitant with population decline in the late 1700s-early 1800s. However, again, a disparate dataset from northern Waiohuli showed that two phases of agricultural development occurred, from small-scale agricultural practices in the A.D. 1200-1400s range to intensified cultivation from the A.D. 1600-1700s. In essence, the Dunn *et al.* (1999) dataset showed a lack of agricultural activity in the A.D. 1400-1600s range, a timeline foreign to the data gleaned from the studies by Kolb *et al.* (1997) and Dega *et al.* (2004)

One issue moderately synchronized for all the projects conducted in the Waiohuli-Keokea area has been the real poverty of material cultural excavated from the sites. For example, a total of 197 traditional-period artifacts and two modern "artifacts" (two sherds) were recovered during testing at twenty-one sites in Keokea (Dega *et al.* 2004), a pattern replicated elsewhere. Other patterns in the assemblages were evident though. Traditional artifacts were primarily derived from basalt, volcanic glass, coral, marine shell, and ocre. The assemblages were often dominated by basalt debitage, indicative of tool manufacturing or re-working activities. The database exhibited an overwhelming dependence on terrestrial tool manufacture, this being expected considering the location of the upland parcels. Southern Waiohuli yielded artifacts associated with domestic activities such as tool manufacture, food preparation, and food consumption while broken adzes suggested forest clearing for agricultural activities and *ulu maika* intimated upland leisure activities.

Yet, the comparative paucity of artifacts (and faunal remains) recovered during the course of the various excavation work is perplexing. On a landscape intensively occupied for a suggested 400+ years, with formal architecture abounding through swales and on ridge fingers, the dearth of material culture stands out in ambiguity. While painless to declare sampling as the cause of such attrition, can other reasons be forwarded? Not yet. Certainly, secular activity areas within structures may yield higher absolute artifact and midden counts, yet these were generally not found during the studies. As it stands at present, the paucity of material culture recovered during the various projects may be a direct result of sampling strategies employed during the respective projects. This strategy emphasized smaller excavation units at a greater number of sites. This methodology was juxtaposed during recent Data Recovery of the project area (Dega *et al.*-in preparation) in which an alternative excavation strategy was undertaken that should provide some finality to the argument that sampling may have been the primary cause for the dearth of recovered material culture in the uplands. The strategy focused on more intensive excavations occurring at fewer sites. This also allowed for more secure interpretations of intra-site patterns.

Marine species are present in upland site middens as food resources and as artifacts, although in small quantity. The respective assemblages were fairly equal in terms of percentage marine vertebrates and invertebrates. The modest amount of marine food remains, as expected, suggests a heavy reliance on terrestrial species and crops and a very low dependence upon coastal resources. However, even the terrestrial faunal counts were only very modest. In Keokea, for example, only about 60% of the excavated sites (n=12/21) yielded any faunal remains and only MNI 117 was recovered, most of these being vertebrates and birds. The percentage of dog and pig remains was low, basically too low to make assessments of social stratification, a difficulty also redundant in the Dunn *et al.* (1999) and Kolb *et al.* (1997) studies. In all the projects, rat (*Rattus exulans*) remains dominated faunal assemblages (66% in southern Waiohuli, for instance), a trait common to more sedentary populations. The presence of such a dominant species in the faunal record suggests that the presence of the rats assumes a stable agricultural base, as the rats would be drawn to perennial grain sources and by extension, sedentary populations. Rats were not a food item, per se, but survived on a stable grain base that could have been produced by upland farmers in Waiohuli and Keokea. In other terms, rats were a by-product of a successful, agriculture-based, sedentary population.

Both confirmed and possible burial sites have been identified during each of the research projects, albeit in modest numbers, with twelve known or possible burials identified on the Keokea landscape, three in northern Waiohuli and twelve in southern Waiohuli. Recent Data Recovery led to the identification of four additional burials in the current project area (Dega *et al.*-in preparation). One burial was identified during this road work project (see below). Based on stratigraphic positioning with dated layers, a majority of the burials were interred during pre-contact and protohistoric times. The burials were predominantly identified within habitation structures (enclosures and platforms mostly) and or in lava tubes in gulches. The fairly small sample of burials may again be a function of the limited testing conducted over the course of the five aforementioned projects. All previously identified burials have remained at their respective sites and all are being preserved in perpetuity.

Finally, the macrobotanical database from Keokea (Dega *et al.* 2004) and Waiohuli (Kolb *et al.* 1997) revealed that the lack of historic introductions in the samples robustly suggests that a majority of the analyzed charcoal dates to a time when native species were prevalent and historic introductions were rare. Based on the presence of several species (*i.e.*, *ʻakoko*, *ʻilima*, *ʻaheahed*), the Keokea landscape was one of lowland dry shrubland community during traditional occupation, with a similar pattern obtained for Waiohuli (not surprising considering their proximity). The modern landscape of Waiohuli-Keokea is dominated by evasive plant species.

Pollen, phytolith, and starch granules analyzed from agricultural contexts in Waiohuli (Kolb *et al.* 1997:264) intimates that sweet potato was a dominant crop in the uplands during prehistoric times, with dryland taro cultivation also being prevalent. These food sources were most often cultivated on terraces, with later-period (~A.D. 1600s) garden enclosures encircling many of these terrace systems.

This brief summary of settlement patterns on the Waiohuli-Keokea landscape serves as a departure point for assessing the sites and features studied during the present revised Inventory Survey project. As seen from the summary, several outstanding issues remain elusive in the upland archaeological record, issues that can be addressed with more finality during the recently completed Data Recovery work (Dega *et al.*-in preparation).

FIELD METHODOLOGY

Fieldwork for this revised Inventory Survey involved 100% survey of each proposed road corridor, manual clearing of the sites, mapping and recording, additional site descriptions and mapping of sites previously identified by Kolb *et al.* 1997 (as necessary), and limited testing. Each strategy is described below.

SURVEY

Full, systematic pedestrian survey (100%) of each road corridor from centerline to right-of-way edge was possible as each road corridor was staked by a professional surveyor's team prior to initiation of work. The stakes were supplemented by base topographical maps depicting individual road corridors. In many instances, the surveyor's accurately mapped the location of archaeological features, some being discussed herein. All sites and component features were marked in the field and located on the main project area plan view map (see Figure 3). This contemporary data is being added to and evaluated with the Inventory Survey database from Kolb *et al.* (1997). This survey was also a necessity to re-identify previously recorded sites and their component features and evaluate whether all sites and their component features were adequately recorded during Inventory Survey.

SITE RECORDING AND MAPPING

All previously unidentified sites/features recognized during the road survey were fully described and mapped during this phase of research. Any site or feature not accurately mapped or recorded during Inventory Survey (Kolb *et al.* 1997) was also subject to mapping and recording. At a base level, all unidentified sites/features occurring in road corridors were fully mapped (plan view and some instances, profile), described (measurements, characteristics of

construction, etc.), and photographed. Survey of sites was also undertaken to account for any artifact dispersion or midden scatters on the surface. Site vegetation and topographical data was also recorded. Again, each newly identified site/feature occurring in proposed road corridors and those portions of sites not previously recorded were subject to site recording and mapping.

EXCAVATION

A majority of the newly identified sites/features were also subject to limited excavation in order to investigate the nature of cultural deposits associated with each site/feature, evaluate site function, and obtain samples for possible radiocarbon dating. All enclosures and platforms were tested, with a sample of terraces being tested. Unlike Data Recovery, time constraints prevented large block units from being excavated at these features. Typically, several test units were placed in each new feature and in some features previously recorded by Kolb *et al.* (1997) not previously subject to testing. Sampling included controlled subsurface excavation at each of the previously unidentified features in the Waiohuli road corridor project area (Table 1).

Excavations were undertaken according to standard excavation procedures. Specific procedures included test unit placement (test unit against at least one wall of each structure), datum establishment, the recovery of materials, and documentation of activities and results.

Table 1: Sites/Features Identified In Road Corridors: Site/Feature No., Road Designation, Site Size and Features, Site Function, and Total Excavation Area.

Road Corridor	No. Previously Unrecorded Features	All Sites with Features in Specific Road Corridors	General Feature Classes of all Features in Specific Road Corridor
Road A	11	3280, 3223, 3221	Enclosure, C-shape, U-shape, Walled Terrace, Wall, Mound, Alignment
Road E	4	3219, 3280, 3263, 3267, 3224	Wall, Enclosure, Mound, Platform, Rock Shelter, Alignment
Road F	1	3280, 3272	Wall, Lava Tube, Terraces, Modified Outcrop, C-shape, Platform
Road G	7	3257, 3269	Terrace, Wall
Road H	4	3272, 3274, 3268, 3280	Wall, Platform/Terrace, Enclosure
Road I	6	3222, 3223	Terrace, Enclosure
Road J	1	3246, 3256	Platform, Enclosure
Road L	1	3227, 3228, 3241	Enclosure, Terrace, Rock Shelter
Road M	0	n/a	n/a
TOTAL	35	18 Sites	Habitation, Agricultural, Boundary

LABORATORY METHODOLOGY AND CURATION

Upon completion of fieldwork, all cultural material and field notes were transported to the main SCS laboratory in Honolulu to be catalogued, processed, and analyzed. Cultural remains were separated and sorted into specific material categories (*i.e.*, animal bone, lithic, shell, charcoal, and sediment).

Taxonomic identification of shellfish and vertebrate remains was performed at the SCS laboratory in Honolulu. Vertebrate faunal remains and shellfish remains were identified to the lowest taxonomic unit possible. The remains were then examined for signs of alteration indicative of their past use as tools, ornaments, or food refuse. Next, the identified remains were counted and weighed. During laboratory processing, no previously unidentifiable human osteological material was discovered among archaeologically recovered vertebrate remains. Lithic artifacts were analyzed by Dr. Robert Spear and are presented in Appendix X.

While all records and cultural samples recovered during the project will be curated by SCS in Honolulu, this is only a temporary situation. The final disposition of curated material will be decided at a later date preferably by DHHL and the Waiohuli Homesteader's Association. Any burials identified during this research will be discussed in a Burial Treatment Plan prepared by SCS for review by the DHHL, Waiohuli Homesteader's Association, MLIBC, and the SHPD. The burials will remain protected in Waiohuli after a decision is rendered by the aforementioned groups.

REVISED INVENTORY SURVEY RESULTS

The results of this revised Inventory Survey are presented by road corridor. All features (and sites) occurring in each road corridor are discussed individually below, first in summation and next by data description. All new features have been assigned to existing sites as in most cases, the previously undocumented features represent a portion of an Inventory Survey site that was not fully recorded. A total of thirty-five (35) features at nine (9) sites compose the previously unidentified feature population within the current Phase I project area. However, a total of eighteen (18) previously recorded sites occur in the road corridors and were also re-evaluated herein. In some instances, known sites were re-identified and re-assessed. Many of these Kolb *et al.* (1997) sites were documented to a satisfactory level and no further work was done at these sites; several features of these sites occurring within various road corridors were re-mapped and/or excavated however. All features discussed below required mapping/recording,

Vertical control was obtained and maintained by the establishment of a datum adjacent to each excavation unit. Vertical control is important for documentation and demonstration of stratigraphic and depositional sequences. Excavation was conducted mainly with trowels and whisk brooms. Whisk brooms were often found to be most useful for delicate removal of silty deposits and for exposure of interfaces between silty layers and ashy subsurface features. Small root-cutters are used to remove roots carefully without disturbing surrounding matrices. Hand-picks were utilized to remove large rocks. The choice of small hand-held instruments was considered necessary due to the fragile nature of the vestiges of cultural material and also due to the occasional thinness of identified strata or lens' encountered. Excavation normally did not require the dismantling of site/feature architecture.

Excavated material was recovered and coded according to horizontal and vertical controls. All excavated sediment was screened to maximize recovery of constituent cultural material. Screening was accomplished with nested 6 mm and 3 mm wire mesh screens. The separation of large (6 mm) and small (3 mm) fractions facilitates visual inspection of the screened material. Following examination of the screened remains, all identified cultural materials were recovered. This material includes food remains (mostly small vertebrate remains), artifactual remains (mostly lithic tools and debitage), charcoal, and *kukui* nut fragments. In the event that human remains were identified, all work in the unit immediately ceased and protocol concerning burials was followed. Only one burial was identified during this project in a road corridor. The remains have been protected *in situ*.

Part of the detailed documentation of exposed subsurface cultural features and layers included scaled illustration. Plan views were illustrated for each identified layer or stratum in each excavation area. Profiles were drawn for all exposed excavation walls in each excavation area. Strata were characterized in terms of internal matrix, constituent cultural material, and the nature of boundaries with adjacent strata. Charcoal was recovered from excavation units for identification and future dating purposes.

Documentation of all field work activities was accomplished on standardized forms and through detailed scaled drawings, an ongoing log-book, and a photographic record. All field work documentation has been organized and compiled in a file system curated at SCS facilities in Honolulu.

test excavations, or both. Please note that only classes of cultural remains recovered during testing are presented in excavation discussions.

ROAD A RESULTS

Road A represents the most substantial road in the Waiohuli Subdivision in that it is the main road connecting DHHL lands from Waiohuli through Keokea. Road A transverses the central portion of the proposed subdivision from Waiohuli in the north to Keokea in the south (see Figure 3). A majority of all the proposed roads in this subdivision are tied to Road A. Road A was placed across the landscape so as to avoid as many archaeological sites/features as possible while still maintaining its function as the main connector road for these multiple DHHL parcels.

ROAD A SUMMARY

A total of five (5) main sites/features were documented in proposed Road A, with a modest number of not previously recorded alignments, wall, and terraces also being noted and described, these latter features being previously unrecorded and associated with Site -3280 or Site -3221. The main Road A site/feature assemblage includes three features not previously documented and associated with Site -3280 (Road A Feature 1 "E-6" enclosure; Road A, Feature 2 "E-7" enclosure; Road A, Feature 3 C-shape), two features previously documented within known sites (Site 3280, Feature U-1 U-shape; Site 3223, Feature WT-3 walled terrace), and alignments, walls, and terraces associated with known sites (Sites -3280, -3221) yet not previously recorded. Features E-6, E-7, and "Feature 3" were first mapped and tested during this program. The Site -3280 U-shaped feature was not previously tested so was excavated herein. The Site -3223 walled terrace feature was previously subject to testing but was subject to additional excavation during Data Recovery (Dega *et al.*-in preparation). Other features such as walls, alignments, and terraces also were recorded in Road A. These features (N=8) are part of known sites (-3280, -3221) yet were not previously recorded. All other features identified during survey of Road A were previously documented to an adequate level by Kolb *et al.* (1997). All the sites investigated on Road A were traditional-period sites.

ROAD A, FEATURE 1 (E-6) SUMMARY

Feature 1 was identified within the boundaries of Site -3280. Designated as E-6 by SCS (incrementally following "E-5" which was recorded by Kolb *et al.* 1997 for Site -3280), this feature was not previously identified. Road A, Feature 1, herein referred to as E-6 of Site -3280, is located along the southern stretch of Road A (see Figure 3) just to the south of a previously identified feature known as "W-4" or wall four (Figures 7 and 8). Feature integrity was assessed

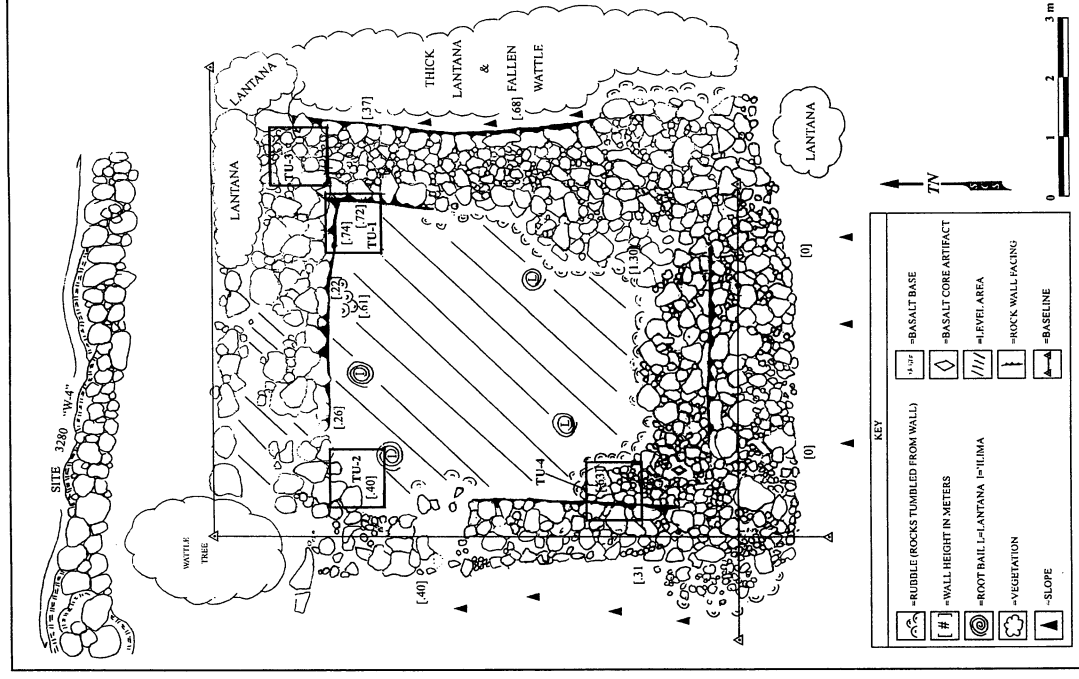


Figure 7: Road A, Site -3280, Feature 1 (E-6), Site Plan View Map.

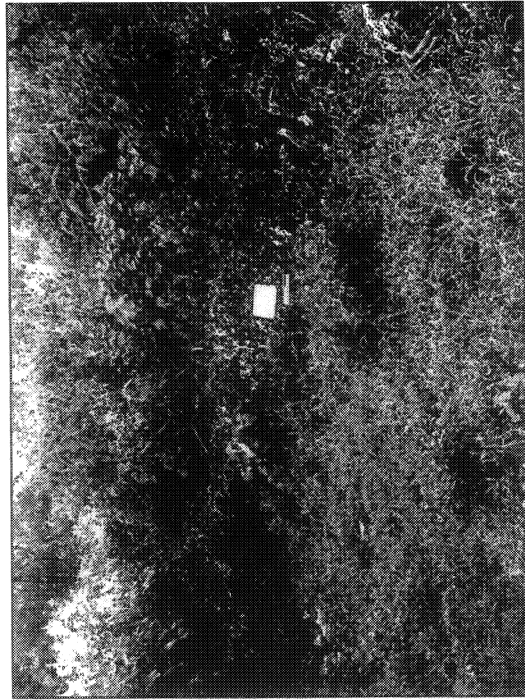


Figure 8: Road A, Site -3280, Feature 1 (E-6) Overview.

as "good", its condition having been slightly altered due to wall tumble, some tree fall on the structure, and limited disturbance by cattle and/or deer.

The feature consists of a 56.25 m² square-enclosure with faced and stacked walls. Five test units were excavated in the enclosure. Various quantities of charcoal, lithics, invertebrate and vertebrate remains were recovered from the units. The assemblage and construction of this feature suggested it to be associated with a habitation function. The presence of pig remains further suggests that the structure may have been utilized as a small men's *hale*. The feature is suspected to have been constructed during traditional times. Charcoal samples were acquired from the unit and being held for future radiocarbon dating.

FEATURE E-6 DESCRIPTION AND TESTING RESULTS

Site -3280, Feature E-6 consists of a square-shaped enclosure measuring 7.5 m long by 7.5 m wide (56.25 m²). The walls of the structure are dominantly double-faced and core filled. Some wall tumble is evident along the northern and eastern interior walls. Composed of cobbles and boulders, the walls of the structure vary from 1.5 m to 2.0 m wide. The interior height of the walls measures 0.22-1.30 m while the exterior wall portions measure 0 to 0.68 m above the

ground surface; the eastern portion of the structure is fairly flush with the ground surface. Feature E-6 is located in a flat area above a swale to the north of feature Wall Four (W-4). Five test units were positioned in various portions of the enclosure to assess feature architecture and the presence/absence of associated cultural materials.

Site -3280, Feature E-6: Test Unit 1 (TU-1)

TU-1, a 1 by 1 m unit, was placed on the interior, northeastern corner of the enclosure. Three stratigraphic layers were identified in the unit (Figure 9). Layer I (0-24 mbs) was composed of reddish brown (5YR 4/3) loose loam. Clastics were few in this layer. Cultural materials included charcoal and basalt flakes. Feature architecture was primarily based at the Layer I/II interface, although basal architecture was evident in Layer III. Layer II (24-48 mbs) consisted of black (5YR 2.5/1) semi-compacted loam with 30% cobble. Basalt flakes, charcoal, and coral were recovered from Layer II. Layer III (48-57 mbs) was composed of dark reddish brown (5YR 3/2) compact loamy silt with 30-50% clastics. This layer was sterile and overlay bedrock at the base of excavations. Feature architecture, at least the earliest construction episode, appeared to have been partially constructed directly on bedrock, with most architecture occurring in Layer II and at the Layer I/II interface. The 0.57 m of sediment accumulation would appear to show a fairly long-term usage of the feature.

Invertebrates

Only 0.1 g of non-diagnostic Echinoidea was recovered from TU-1.

Artifacts

A small assemblage of traditional artifacts was recovered from TU-1. These include a basalt adze perform, a basalt core, a basalt flake with polish, and basalt debitage. Besides the only "finished" tool (flake with polish), the other three lithic classes intimate that lithic manufacturing, even to a moderate degree, occurred on site.

Botanicals

TU-1 yielded 81.3 g of charcoal, with almost 99% being recovered from Layer II, the predominant cultural stratum at the site.

Vertebrates

A total of 46.1 g of vertebrate remains were recovered from TU-1. These included 10 g of cf. *Procellariidae* and 36.1 g of cf. *Sus scrofa* (pig), the latter from Layer I. The presence of

the pig remains, although a small sample, is consequential in that pigs were normally only by males in pre-Contact Hawaii; they were also used as offerings.

Coral

Layer II yielded a total 90.5 g of fragmented coral (nine pieces). The coral was not worked into a tool but simply was recovered from the cultural layer. The presence of the coral, carried from the distant coastal, provides one indication that more specialized practices may have occurred at the feature.

Site -3280, Feature E-6: Test Unit 2 (TU-2)

TU-2 was excavated on the interior, northwestern corner of E-6. The unit, measuring 1 by 1 m, yielded four discrete strata (Figure 10). Layer I (0-0.15 mbs) was composed of dark reddish brown (5YR 3/2) silt loam with c. 15% cobbles. Few large to fine roots were present. Layer I was sterile. Layer II (0.15-0.50 mbs) consisted of dark reddish brown (5YR 2.5/2) silty loam with 55% clastics. Many large to fine roots were present in this stratum. Layer II yielded pieces of lithic debitage, some shell, a large coral abrader, fractured coral fragments, and several faunal remains. Layer III (0.50-0.60 mbs) was composed of dark brown (10YR 3/3) silty loam with c. 60% clastics (pebbles, cobbles, and boulders). A moderate frequency of medium to fine roots were present throughout the stratum. Layer III yielded 15 pieces of lithic debitage, one coral fragment, and a piece of ochre. Layer IV (0.60-0.70 mbs) consisted of dark reddish brown (5YR 2.5/2) silt loam with c. 50% clastics. Moderate frequencies of large to fine roots were present. Layer IV was culturally sterile. Feature architecture was based at the Layer II/III interface, in direct relation with cultural debris.

Invertebrates

A minimal amount of shell was collected from TU-2, this not surprising considering the upland nature of the project area. In total, only 0.8 g of non-diagnostic marine shell and 0.3 g of *Conus* sp. were recovered from the unit.

Artifacts

A varied lithic assemblage was recovered from TU-2, most being from Layer II. These include fragments of basalt debitage, basalt flakes with polish, and volcanic glass debitage. Other significant artifacts included a coral abrader, miscellaneous basalt debitage fragments, and a fragment of volcanic glass debitage. This diverse assemblage again may reflect some on-site tool manufacturing and use (food preparation, etc.).

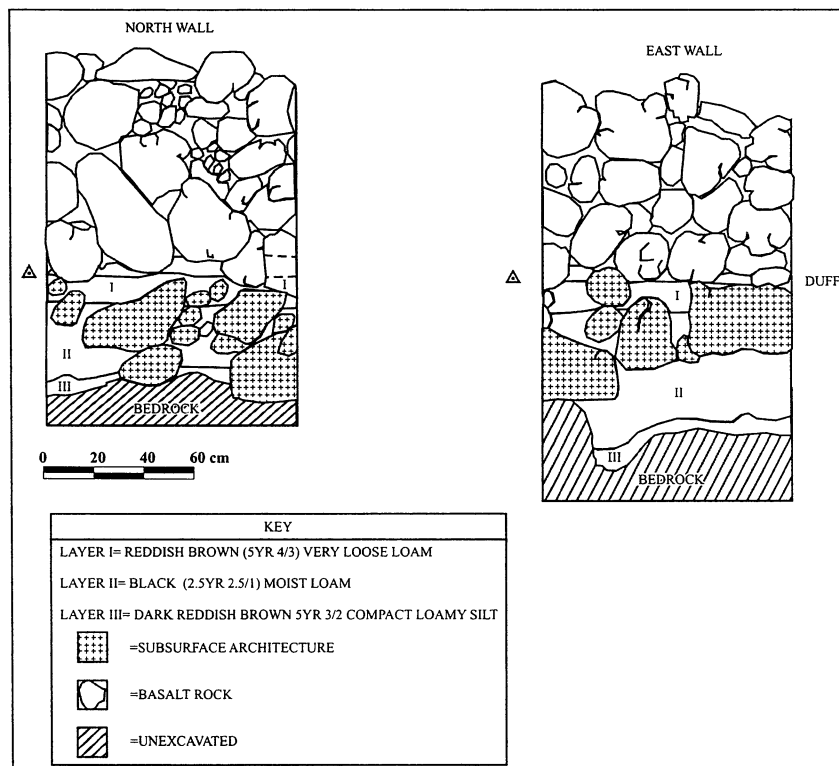


Figure 9: Road A, Site -3280, Feature E-6, TU-1 Profile.

Botanicals

A total of 83.6 g of charcoal was recovered from TU-2. Of this sample, 79.9 g came from Layer II, the predominant cultural layer of the feature.

Vertebrates

The faunal record of TU-2 is extremely modest: 0.3 g of fish and 0.1 g bird, both from Layer II. The presence of the fish remains, however slight, does show human transport of goods over a fairly long distance from the coastline.

Coral

Layers II-IV yielded a total 38.3 g of fragmented coral (16 pieces). The coral was not worked into tools but simply was recovered from the Layer II cultural stratum.

Site -3280, Feature E-6: Test Unit 3 (TU-3)

TU-3, also a 1 by 1 m unit, was placed on top of feature architecture along the northeastern corner of Feature E-6. Architecture in this location consisted of a stacked and faced wall on the western flank and a single rock alignment along the eastern flank. The wall is cobble-filled utilizing small-medium sized rocks. Feature architecture was predominantly based in Layer I. Four natural strata were identified in the unit, the unit's basal depth being 1.20 mbs (Figure 11). Layer I (0-0.35/0.50 mbs) was composed of very dark gray (5YR 3/1) fine loamy silt with 30% cobble content. The sediment was very loosely compacted around the architecture cobbles and boulders as the result of natural Aeolian processes. This stratum was sterile. Layer II (0.40-0.80 mbs) consisted of very dark gray (10YR 3/1) fine loamy silt with moderate dark reddish gray (5YR 4/2) mottling. The matrix was composed of 30%-50% cobbles and was also sterile. Layer III (0.75-1.0 mbs) consisted of very dark gray (10YR 3/1) to black (5YR 2.5/1) fine loamy silt. The matrix was composed of 30%-50% cobbles and was sterile. Layer IV (1.0-1.20 mbs) was composed of dusky red (2.5YR 3/2) fine loam and silt with common saprolitic material, the latter denoting its proximity to bedrock. No cultural materials were recovered from Layer IV.

Site -3280, Feature E-6: Test Unit 4 (TU-4)

TU-4 was excavated on the interior, southwestern corner of E-6, with the western flank of the unit abutting interior facing of the enclosure wall. The unit, measuring 1 by 1 m, yielded two discrete strata underlying a dark reddish brown (5YR 3/2) duff layer on the surface (Figure 12). Layer I (0-1.15 mbs) primarily contained feature architecture was composed of very dark brown (10YR 2/2) ashy silt with c. 60-70% small to medium construction cobbles. Cultural material

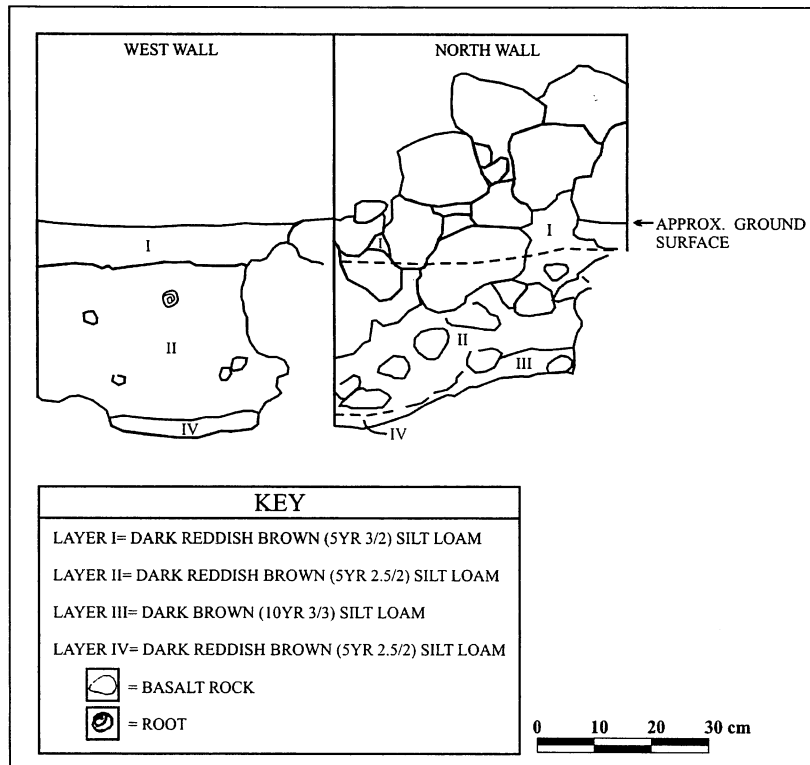


Figure 10: Road A, Site -3280, Feature E-6, TU-2 Profile.

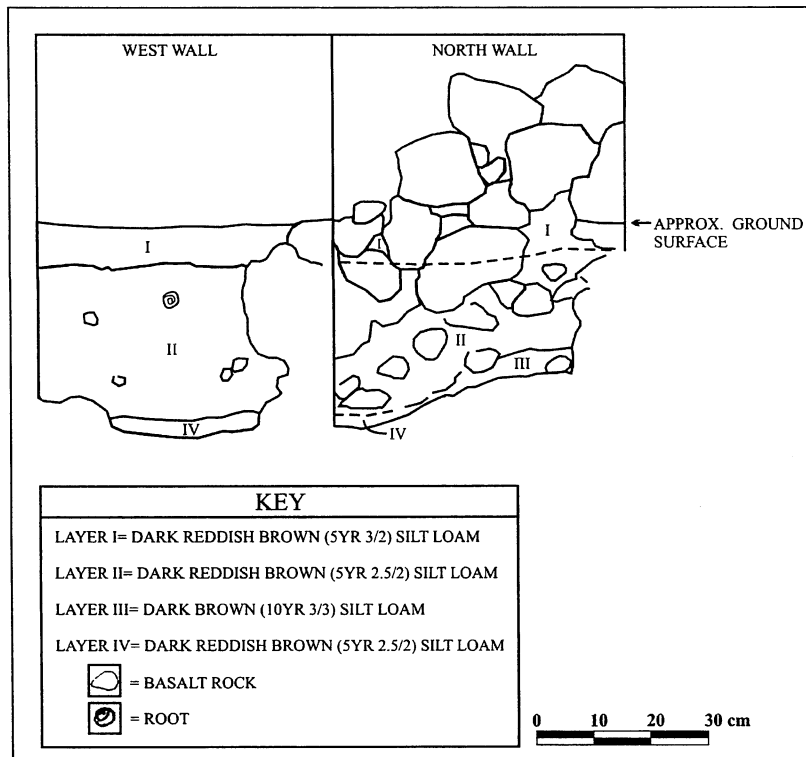


Figure 12: Road A, Site -3280, Feature E-6, TU-4 Profile.

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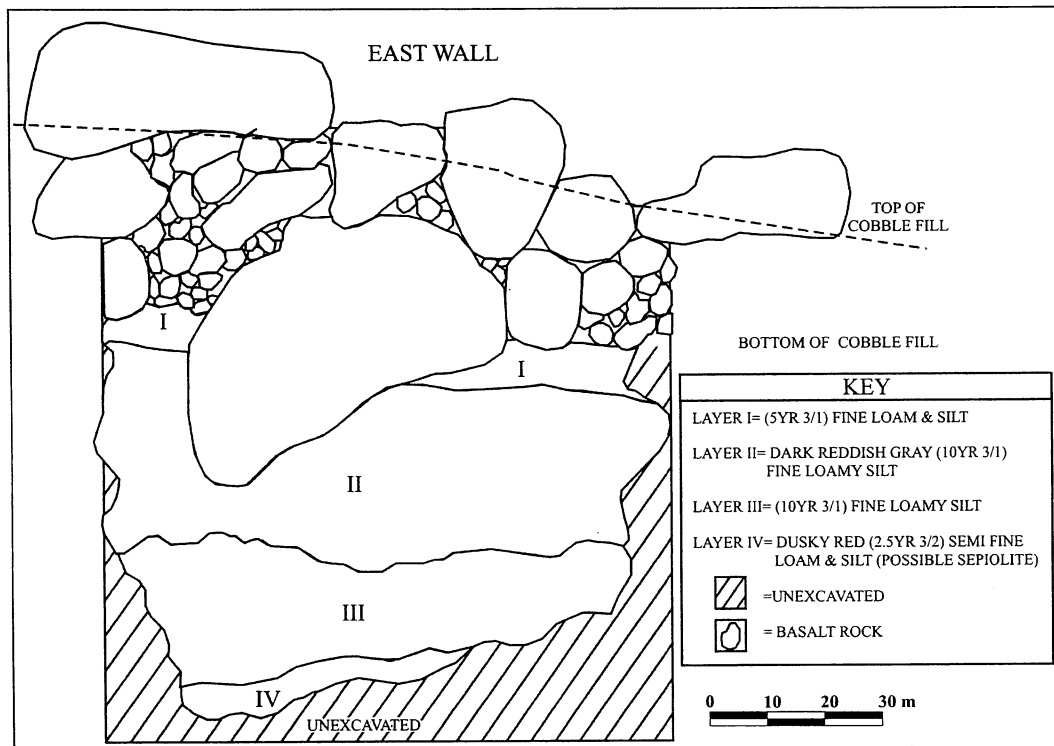


Figure 11: Road A, Site -3280, Feature E-6, TU-3 Profile.

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acquired from Layer I included lithics, charcoal, and faunal remains. Few large to fine roots were present. A small ash lens was apparent near the Layer I/Layer II interface but was not a formalized hearth and mainly represented well distributed charcoal flecking to 1.15 mbs. Layer II (1.15-1.37 mbs) consisted of very dark brown (7.5YR 2.5/3) silty loam with 60-70% small to medium construction cobble. Common large to fine roots were present in this stratum. Layer II was culturally sterile. As observed through TU-4, feature architecture was primarily based in Layer I, the principal cultural depositional unit.

Invertebrates

A minimal amount of shell was collected from TU-4 and included only 0.3 g of *Cypraea* marine shell.

Artifacts

A varied lithic assemblage fairly reflective of a lithic working station was recovered from TU-4, all artifacts being recovered from Layer I. These include fragments four basalt cores, basalt debitage, and two basalt adze fragments.

Botanicals

A total of 190.5 g of charcoal was recovered from TU-4. Of this sample, all charcoal came from Layer I, the predominant cultural layer of the feature. The high frequency of charcoal in this unit reflects the presence of the ash lens at the base of Layer I.

Vertebrates

The faunal record of TU-4 was modest and includes 0.2 g of unidentified fish, 0.3 g rat, and 1.9 g of unidentified mammal. Again, the presence of the fish remains, however slight, does again show human transport of goods over long distances from the coastline and/or trading between upland and coastal regions.

Site -3280, Feature E-6: Test Unit 5 (TU-5)

TU-5 was excavated in the southeastern corner of E-6 atop a terrace wall. The unit, measuring 1 by 1 m, yielded two discrete strata and feature architecture. Layer I (0-0.95 mbs) was composed of dark reddish brown (5YR 3/2) silt loam with 60-70% cobbles. Common large to fine roots were present. Layer I yielded a sparse amount of faunal material, basalt debitage, kukui shell, and charcoal in its upper 0.20 m. Feature architecture was primarily based in this layer in association with the cultural materials. Layer II (0.95-1.25 mbs) consisted of dark reddish brown (5YR 2.5/2) silt with many clastics. Many large to fine roots were also present in

this stratum. Layer II was sterile. Remnants of feature architecture were also present in portions of Layer II.

Artifacts

The only artifacts acquired from TU-5 were several fragments of basalt debitage.

Botanicals

A total of 9.5 g of *kukui* shell and 9.9 g of charcoal were recovered from upper portions of Layer I. The remainder of the test unit was sterile.

Vertebrates

A small amount of faunal remains were recovered from TU-5. The remains included 0.1 g of rat and 6.2 g of *Sus scrofa* (pig remains). Coupled with the pig remains from other test units in the feature, this finding provides more evidence that this feature could have been a men's *hale*.

ROAD A, FEATURE 2 ("FEATURE E-7") SUMMARY

Feature 2, assessed as a habitation enclosure, was also identified within the boundaries of Site -3280 c. 4.5 m to the north of Feature U-1 (see above). This feature was not previously identified and has been designated as "E-7" by SCS (following "E-5" and "E-6" which was recorded by Kolb *et al.* 1997 for Site -3280). Road A, Feature 2, herein referred to as E-7 of Site -3280, is located along the southern stretch of Road A (see Figure 3) just to the north of a previously identified feature known as "U-1" or U-Shape one (Figures 13 and 14). Feature integrity was assessed as "good", its condition having been only slightly altered due to gravitational wall tumble. Like Feature U-1, Feature E-7 occurs at the base of a small ridge in a shallow swale.

Feature E-7 consists of a 40.26 m² square-enclosure with partially faced and stacked walls. Two test units were excavated in the enclosure. Modest quantities of charcoal, lithics, and invertebrate remains were recovered from the two units. The modest cultural assemblage, coupled with construction and morphology of this feature suggested it to be associated with habitation. Based on the material record of E-7, the feature is suspected to have been constructed during traditional times. Charcoal samples were acquired from the unit and being held for future radiocarbon dating.

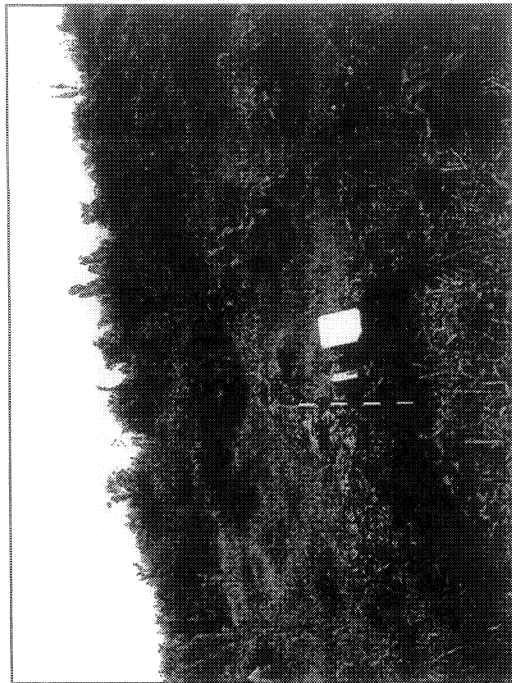


Figure 14: Road A, Site -3280, Feature 2 (E-7) Overview, View to East.

FEATURE E-7 DESCRIPTION AND TESTING RESULTS

Site -3280, Feature E-7 consists of a square-shaped enclosure measuring 6.6 m long by 6.1 m wide (40.26 m²). The walls of the structure are dominantly stacked with only slight facing occurring on the south, east, and west flanks. Composed of a variable 3-5 courses of cobbles and boulders, the walls of the structure vary from 1.0 m to 1.25 m wide. The interior height of the walls measures 0.45 m while the exterior wall portion measures 0.50 m above the outer ground surface; the interior space of the feature measures 3.4 m by 3.6 m (12.24 m²). Feature E-6 is located in a shallow swale some 4.5 m to the north of Feature U-1 (see above). Two test units were positioned in the center and northwestern corner of the enclosure, respectively, to assess feature architecture and the presence/absence of associated cultural materials.

Site -3280, Feature E-7: Test Unit 1 (TU-1)

TU-1, a 1 by 1 m unit, was placed on the interior, northwestern corner of the enclosure. An upright stone, part of feature construction, occurred just to the north of the unit but is visible in the unit profile (Figure 15). Three stratigraphic layers were identified in TU-1. Layer I (0-0.40 mbs) was exclusively an architectural layer, with only very modest amounts of Aeolian-driven sediment occurring in rock crevices. Layer II (0.40-0.77 mbs) consisted of very dark gray (5YR 3/1) loam with c. 50% cobble. Only a small amount of charcoal and an adze preform were

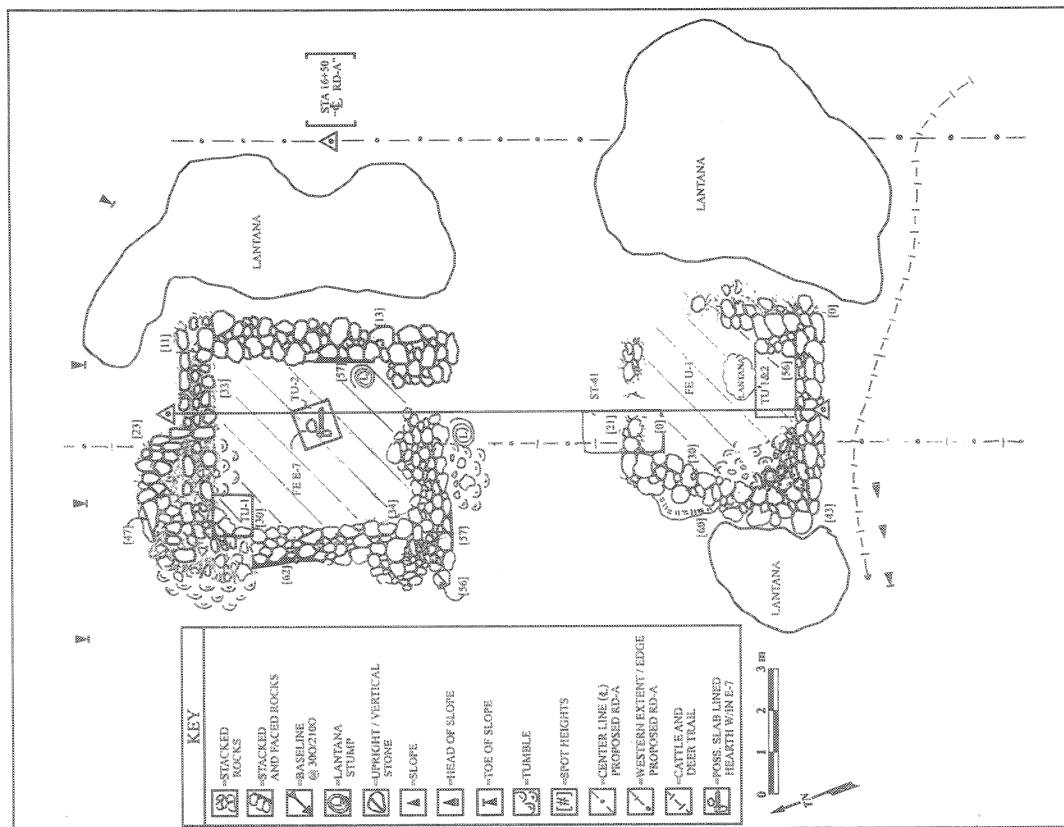


Figure 13: Road A, Site -3280, Features E-7 and U-1 Site Plan View Map.

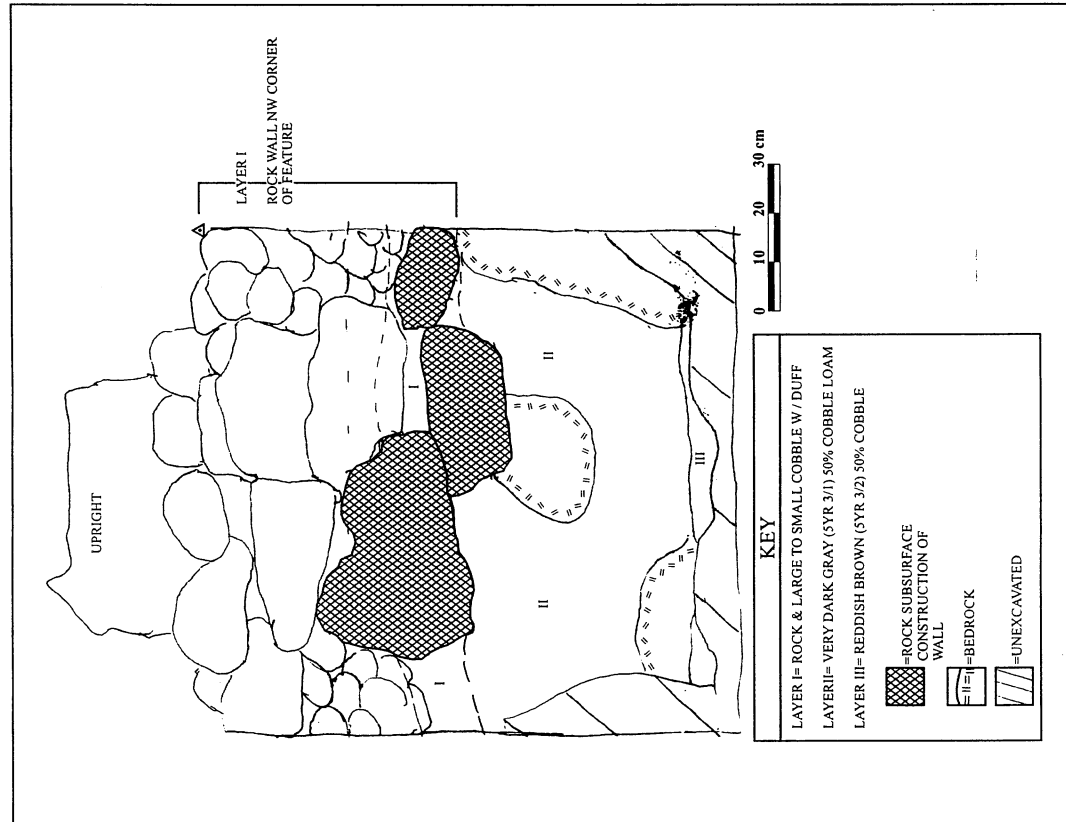


Figure 15: Road A, Site -3280, Feature E-7, TU-1 Profile.

recovered from Layer II. Feature architecture was predominantly based on Layer II. Layer III (0.77-1.05 mbs) was composed of dark reddish brown (5YR 3/2) loam with 50% clastics. This layer was culturally sterile and overlay bedrock at the base of excavations. Possible remnant feature architecture occurred at the top of Layer III.

Artifacts

Only one artifact was recovered from TU-1: a basalt adze perform identified at 0.50 mbs. This artifact occurred in direct association with the feature wall.

Botanicals

TU-1 yielded only 0.8 g of charcoal, all from Layer II.

Vertebrates

Only one faunal remain was recovered from TU-1, this being 10 g of cf. *Procellariidae*.

Coral

Layer II yielded a total 2.4 g of fragmented coral (one piece). The coral was not worked into a tool but simply was recovered from the cultural layer.

Site -3280, Feature E-7: Test Unit 2 (TU-2)

TU-2 was excavated in the center of E-7 to investigate a possible hearth that was apparent by a formed slab on the surface of the feature. The unit, measuring 1 by 1 m, yielded three strata (Figure 16). A hearth was present in the feature. Layer I (0-0.20 mbs) was composed of black (5YR 2.5/1) silt with c. 30% cobbles. Many fine roots were present. Layer I yielded small quantities of basalt flakes, some with polish, and charcoal. Layer II (0.20-0.30 mbs) consisted of very dark gray (5YR 3/1) ashy silt with 30-50% clastics. Many fine roots were present in this stratum. Layer II also yielded charcoal associated with the subsurface feature (hearth; see below). Layer III (0.30-0.35 mbs) was composed of strong brown (7.5YR 5/6) saprolitic fragments overlying bedrock. This layer was sterile.

One subsurface feature was documented in TU-2, a formalized slab-lined hearth occurring from the surface to the base of Layer III. The hearth measured 0.60 cm in diameter (plan view angle) and occurred from 0.04 m above the surface (slab) to 0.35 m below the surface (Figure 17). The hearth was lined by three small, upright slabs, these also extending from the surface to Layer III. The fill of the hearth was composed of black sediment (charcoal-infused) with several basalt flakes and marine shells. The feature, exposed on the surface, had been

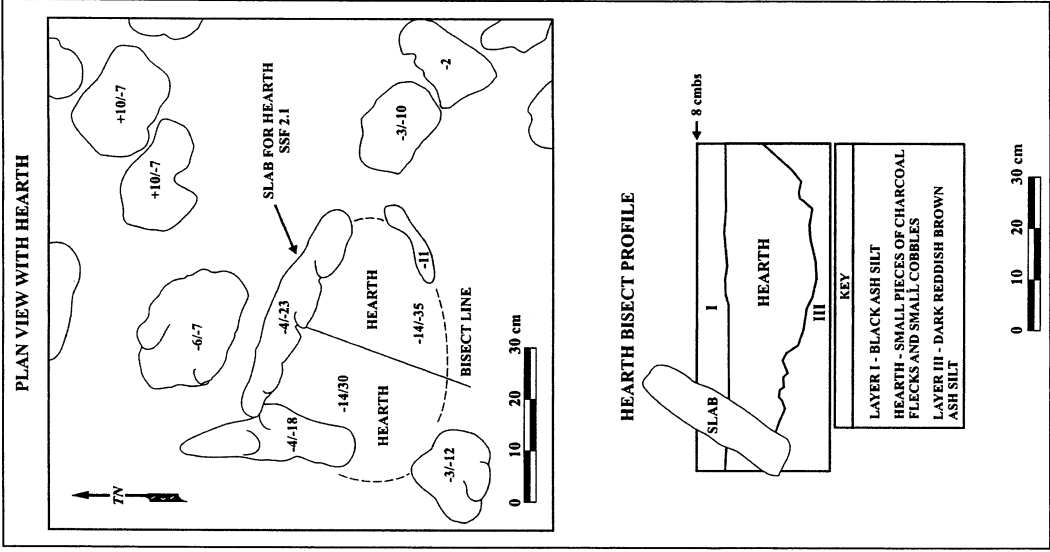


Figure 17: Road A, Site -3280, Feature E-7, TU-2 Plan View with Hearth and Bisection Profile.

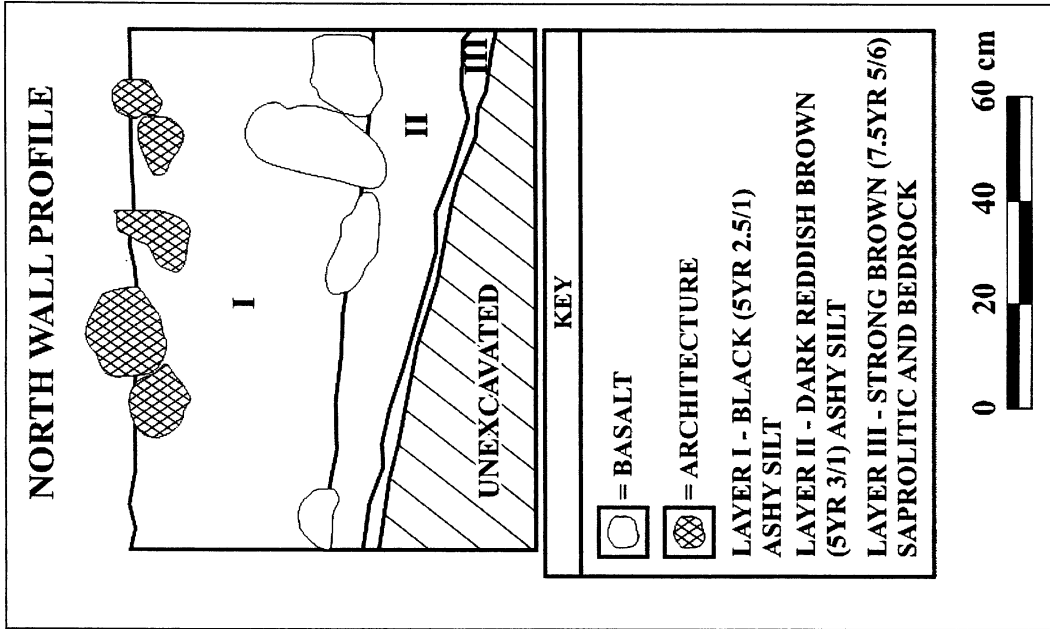


Figure 16: Road A, Site -3280, Feature E-7, TU-2 Profile.

altered. However, charcoal and soil samples were acquired from the hearth for possible dating and botanical identification.

Invertebrates

A minimal amount of shell was collected from TU-2. In total, only 0.7 g of non-diagnostic marine shell was recovered from the unit.

Artifacts

A somewhat diverse lithic assemblage was recovered from TU-2, all being from Layer I and Layer II. The assemblage includes seven pieces of basalt debitage, seven basalt flakes with polish, and one fragment of volcanic glass. While this diverse assemblage may reflect some on-site tool manufacturing and use (food preparation, etc.), the sample size remains small.

Botanicals

A total of 3.8 g of charcoal was recovered during screening from TU-2, all from Layers I and II. However, this figure is misleading as a 2.5 kilogram (kg) sample of the hearth interior was acquired and contains much more charcoal.

ROAD A, "FEATURE 3" SUMMARY

Feature 3, assessed as a small habitation C-shaped structure and possible auxiliary platform along its northern extension, was identified within the boundary of Site -3280 c. 1.5 m to the southeast of Site -3280, Feature U-1 (see below). This feature was not previously identified and was designated as "Feature 3" in the field by SCS. The feature was identified and tested during fieldwork at U-1 and is also associated with Site -3280. Feature integrity was assessed as "poor", its condition having been altered by cattle movement across the area. Feature 3 occurs near the base of a small ridge in a shallow swale.

Feature 3 consists of a 39.00 m² square-enclosure composed of medium to large stacked cobbles and boulders (Figure 18). A smaller, auxiliary feature occurs to the north of the main C-shape, this being a small platform. This platform, to use the term loosely, measures 5 m² and has a slightly awkward morphology built over outcropping. Six stratigraphic trenches were excavated in various locations of the structures. Testing yielded only negative results; no cultural materials were recovered from Feature 3 and the extended platform. The lack of cultural assemblage, coupled with construction, morphology, and poor preservation of this feature made determining feature function difficult. Based on the nature of C-shaped structures in the area, Feature 3 is estimated to be a habitation structure. The lack of materials, especially compared

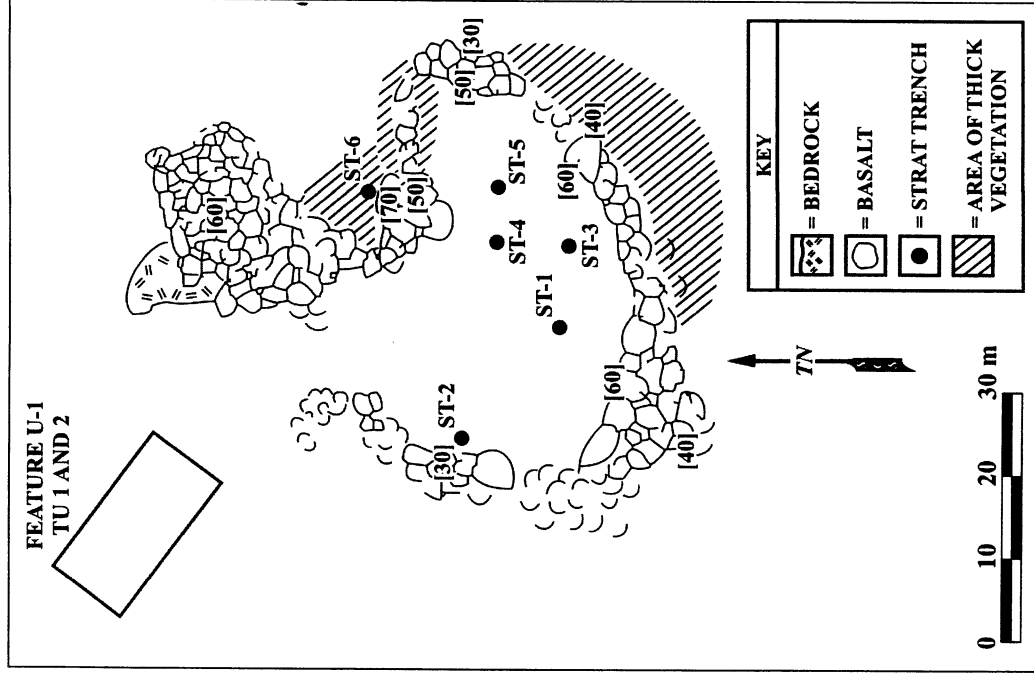


Figure 18: Road A, Site -3280, "Feature 3" Plan View Map.

with the adjacent features U-1 and E-5 and E-6, intimates that Feature 3 could have been a structure auxiliary to habitation, a location in which activities occurred where no cultural signature would be present. The presence of the "platform" may reflect another auxiliary structure or the remnant of a larger structure incorporating both structures.

FEATURE 3 DESCRIPTION AND SUMMARY TESTING RESULTS

Feature 3 in Road A consists of a C-shaped enclosure measuring 6.6 m long by 6.1 m wide (40.26 m²). The walls of the structure are stacked 3-4 courses high, with wall facing present on the south and east flanks. Composed of cobbles and boulders, the walls of the structure vary from 0.40 m to 1.15 m wide. The interior space of the C-shape measures 16 m². To the north of the C-shape opening, a small "platform" was also recorded. This sub-feature measures 2.5 m long by 2.0 m wide (5 m²) and is slightly awkward in morphology, this perhaps being a function of being construction on uneven bedrock and due to the disturbance. This sub-feature is faced on its northern and eastern flanks and is composed of 2-3 courses of cobbles and small boulders. Six stratigraphic trenches were positioned throughout the main feature and the sub-feature to assess feature architecture and the presence/absence of associated cultural materials.

Feature 3: Stratigraphic Trench 1-6 (ST-1 through ST-6)

A total of six stratigraphic trenches were placed in various locations of Feature 3 (see Figure 18). The units varied in size and depth of excavation but averaged 0.30-0.40 m in diameter. The units were manually excavated from a minimum 0.15 mbs to a maximum 0.40 mbs, the shallow nature of the sediment overlying bedrock being extensive. Sedimentary deposits were characterized in each trench by rocky silt (70% clastics) commingled with eroding saprolite, both deposits overlying bedrock. No cultural materials were recovered from any trench. The function of Feature 3 remains somewhat enigmatic, although present evidence in the form of site architecture and morphology suggests the structures to be auxiliary to habitation. These may be locations in which activities occurred but failed to leave a cultural signature. The somewhat disturbed nature of Feature 3 may also have contributed to its ambiguity.

SITE -3280, FEATURE U-1 SUMMARY

Feature U-1 of Site -3280 occurs in Road A at the intersection of Road A and Road E (see Figure 13). The feature was previously recorded during Inventory Survey (Kolb *et al.* 1997:A-271) but was not subject to testing at that time. The feature, assessed as a U-shaped, non-habitation locus, was re-mapped and tested during the present survey. Two excavation units (TU-1 & TU-2; ST-1) failed to yield much data in the form of cultural materials or midden. Only a minimal amount of charcoal and a volcanic glass flake were recovered from the feature.

A loose, buried soil deposit along the northern, open flank of the feature provided some evidence that this structure may have been an enclosure before it was impacted at some point in the past. The function of Feature U-1 remains elusive, but is likely related to a habitation function, as is the case with most U-shaped features. The dearth of associated cultural materials may simply reflect sampling issues or a later period, short-term use of the feature. The integrity of the feature is in fair condition.

FEATURE U-1 DESCRIPTION AND TESTING RESULTS

Kolb *et al.* (1997:A-271) state that Feature U-1 consists of a U-shaped structure located in a swale and measuring 3.7 m long by 2.5 m wide (9.25 m²). The walls range from 0.30 to 0.65 m wide, interior heights range from 0.10 to 0.20 m, and exterior heights range from 0.10 to 0.50 m. The feature was constructed of one to two courses of small to medium cobbles. Feature preservation is fair. The location of the structure in a swale suggested a non-habitation function.

The SCS crew recorded this feature as dominantly an irregular-shaped foundation remnant stacked 2-3 courses high. A possible remnant wall was documented along the western flank of the structure, adjacent to an enclosure (Feature E-7; see above). This data, along with excavation information from ST-2 (see below) intimates that Feature U-1 may have been an enclosure at one time but has since been altered. Two test units and one stratigraphic trench were placed on the interior of the structure and partially through its northern wall flank.

Site -3280, Feature U-1: Test Unit 1 (TU-1) and Test Unit 2 (TU-2):

TU-1 and TU-2 represent a 1 x 2 m unit placed along the southern wall of Feature U-1 to examine feature construction and the presence/absence of associated cultural materials. Two main strata were exposed in the combined unit (Figure 19). The unit measured from the surface to a maximum depth of 0.43 meters below the surface (mbs). Layer I (0-0.30 mbs) was composed of very dark gray (10YR 3/3) ashy silt and c. 35% clastics in the matrix. Roots were common. Two small charcoal deposits were identified and collected at 0.10-0.12 mbs in the southwest and northwest corners of the unit. All cultural materials were collected in the upper 0.15 m of the layer and include charcoal, a volcanic glass flake. Natural rock patination (clear rock flakes) was also present in Layer I. Layer II (0.30-0.43 mbs) consisted of dark reddish brown (5YR 3/2) fine silt with 30% pebble and cobble inclusions. Few roots were evident. Layer II was devoid of cultural materials and bedrock was reached at 0.43 mbs.

Artifacts

Only one small volcanic glass flake was recovered from TU-1 and TU-2 excavations, this identified within the upper portion of the layer.

Charcoal

Charcoal was exclusively recovered from Layer I at 0.10-0.12 mbs. The charcoal deposits were minimal, totaling only 2.1 grams (g).

Site -3280, Feature U-1: Stratigraphic Trench 1 (ST-1)

ST-1, a 1 x 2 m unit, was placed in the northern portion of Feature U-1 in order to expose buried architecture and aid in determining if the feature was an enclosure or a U-shape structure. Two stratigraphic layers were identified in the unit (Figure 20). Layer I (0-0.40 mbs) was composed of black (5YR 2.5/1) ashy silt with 45% clastics. This layer appeared to be a "cultural fill" or loose soil that potentially contained a rock alignment (for enclosure). No cultural materials were recovered from Layer I. Layer II (0.40-0.50 mbs) consisted of dark reddish brown (5YR 3/1) silt with c. 55% clastics. Roots were common in this stratum. Layer II was devoid of cultural materials. While excavation of ST-1 failed to yield cultural materials, the nature of Layer I soil alluded to the possibility that a former alignment may have occurred along the northern flank of Feature U-1. As such, the feature may have been an enclosure at one time.

PREVIOUSLY UNRECORDED SECONDARY FEATURES

A total of eight secondary features were documented during this revised Inventory Survey in Road A. Five of the features are associated with Site -3280 but were not previously recorded. Three features are associated with Site -3221 and were also not previously recorded.

Site -3280 Additional Features

Feature "L-2" and "L-2a" were recorded within the boundaries of Site -3280 as a combination of features (designated as two features, L-2 and L-2a) inclusive of a wall and modified outcrop and a cluster of mounds. These features occur within the Road A corridor near the central-southern portion of Road A near Feature 1 (see E-6, above). The feature cluster was identified within the base of a heavily vegetated, small swale. The feature wall consists of loosely stacked cobbles and boulders incorporating natural bedrock outcrop and is non-distinctive due to poor preservation. The function of the wall-modified outcrop is unknown. Some 15+ small clearing mounds occur to the north of the wall-modified outcrop and were interpreted as sweet potato mounds. It is likely that the wall-modified outcrop also functioned in an agricultural capacity.

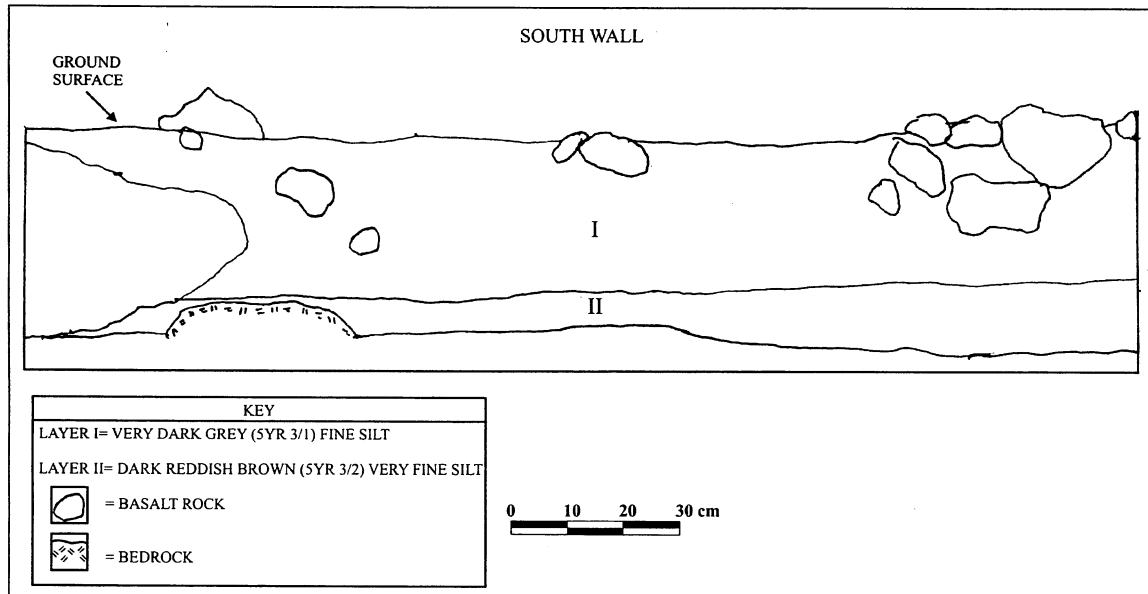


Figure 19: Road A, Site -3280, Feature U-1, TUs 1 and 2 Profile.

Feature "L-3" was identified in -3280 near "L-2". This feature may be part of Site -3280, WT-1 or T-17/18 which was previously recorded as an irregular terrace (Kolb *et al.* 1997:A-268). The terrace of "L-3" is L-shaped and composed of loosely stacked/piled small to large cobbles. The feature appears to be more a remnant as it has been disturbed by cattle and the weight of heavy vegetation. This feature was assessed in the field as an agricultural site, possibly for taro cultivation of modest size.

Feature "W-4" was identified in Site -3280 and extends from Road A to Road E and west to Road F (see Figure 3). This feature was previously documented by Kolb *et al.* (1997:A-272) and was simply noted here as containing two flanks of the wall in Road A. Feature W-4 runs partially across Road A in two adjacent locations. The wall itself is fairly linear and constructed partially upon outcrop. Cobbles and boulders form the wall and were stacked 4-6 courses high, with some sections being faced. This feature was interpreted as a boundary wall associated with a contiguous series of walls, terraces, and modified outcrops (Kolb *et al.* (1997:A-272).

Feature M/O-1 (Site -3280) is also associated with Site -3280 and consists of a cluster of clearing mounds and sweet potato mounds. These features were located in Road A near W-4 (above) and consist of various modified outcrops and stacked cobble and boulder mounds. These features were interpreted to have an agricultural function, both to clear rocks from the landscape (for taro cultivation and such) and as mounds to trap moisture for sweet potato cultivation.

Feature M/O-1 (Site -3221) is associated with Site -3221 and is located on top of a small ridge at the southern boundary of Road A where it meets the northern flank of the Keokea subdivision. This feature was not previously recorded and is directly associated with Site -3221, WT-7, a feature that was recorded (an irregular walled terrace; Kolb *et al.* 1997:A-97). This feature consists of a mound composed of loosely stacked a' a cobbles and boulders and measures 3.6 m long by 1.8 m wide (6.48 m²). The mound averages 0.40 m above the ground surface and is in fair condition, having been slightly altered by cattle and ranching pursuits.

Feature 4 (Site -3221) consists of an alignment located in the southern section of the Road A corridor near the Keokea subdivision. The linear alignment is composed of 1-3 courses of cobbles and boulders (0.75 m wide) and traverses down a slope to the west, abutting Feature 5 (see below). The alignment in this location is c. 45 m long and the western-most end of the alignment occurs in Road A (Figure 21).

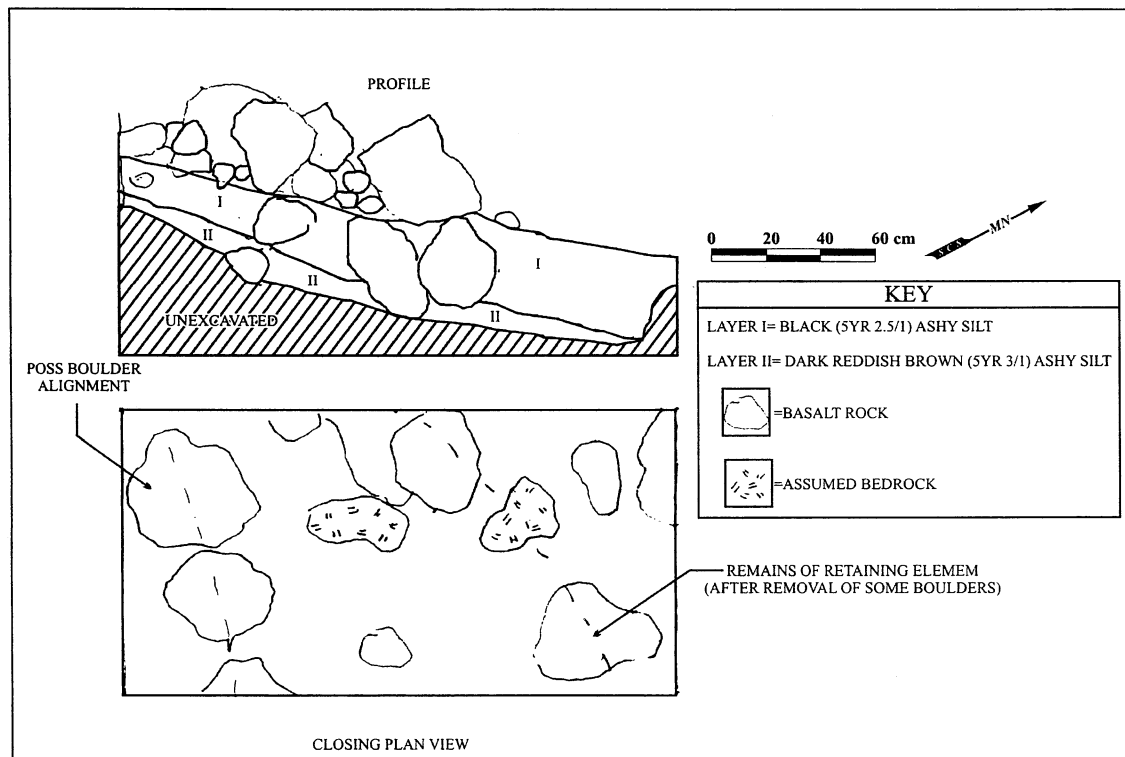


Figure 20: Road A, Site -3280, Feature U-1, ST-1 Profile and Plan View.

Feature 5 (Site -3221) is associated with Feature 4 above and consists of a series of terraces forming a right angle to the Feature 4 alignment. The terraces average 9.5 m long and 0.50 m high. Vegetation in the area is extremely heavy. Combined with Feature 4, the terraces and alignment form a traditional agricultural complex (see Figure 21).

ROAD E RESULTS

ROAD E SUMMARY

Portions of five former sites and four newly identified features were documented within the Road E corridor (see Figure 3). Portions of sites occurring in Road E that were previously identified and documented during Inventory Survey (Kolb *et al.* 1997) include the following: Sites -3219 (W-1), -3280 (W-4), -3263 (E-1, L-1, M/O-1), -3267 (P-1), and -3224 (L-1). These consist of walls, an enclosure, a platform, an L-shaped terrace, and modified outcrops. Several of these features were re-mapped while others were re-mapped and tested herein. Four new features (designated Features 1-4) not previously identified were discovered during this road survey. These sites were mapped and recorded and consist of three platforms and a rock shelter. The platforms were also subject to testing. These four features have been associated with the larger Site -3280. A majority of the sites/features recorded in Road E were interpreted as small habitation loci and agricultural areas. Cultural materials recovered from testing were minimal in frequency but did show a pattern related to traditional-period occupation of the landscape.

SITE -3219 FEATURE DESCRIPTION

Also crossing Road E, Site -3219 W-1 is a wall interpreted as an agricultural boundary feature (Kolb *et al.* 1997:A-91). This feature is located approximately 14.0 m southeast of Site -3280 W-4 (see above) and runs roughly parallel to the other wall (Figure 22). Vegetation surrounding the wall consists of lantana and *'ilima*. This feature was re-mapped during the current work but was not tested. The 3-5 course high wall, attaining a maximum height of 0.80 m, was constructed of small to medium cobbles and was core-filled with pebbles. The wall measures 57.2 m long and has an average wall thickness of 1.0-1.5 m. Large portions of the wall are faced on both flanks. Mechanical and animal disturbance have tumbled several sections of the wall.

SITE -3280, W-4 FEATURE DESCRIPTION

Spanning across Road E, Site -3280 W-4 is an irregular wall-shaped wall interpreted as an agricultural boundary (Kolb *et al.* 1997:A-272). Vegetation surrounding this feature consists of lantana, *'ilima*, and *panini*. This feature was relocated and subject to mapping during this phase of research (see Figure 22). W-4 is constructed of small to large cobbles. The wall is

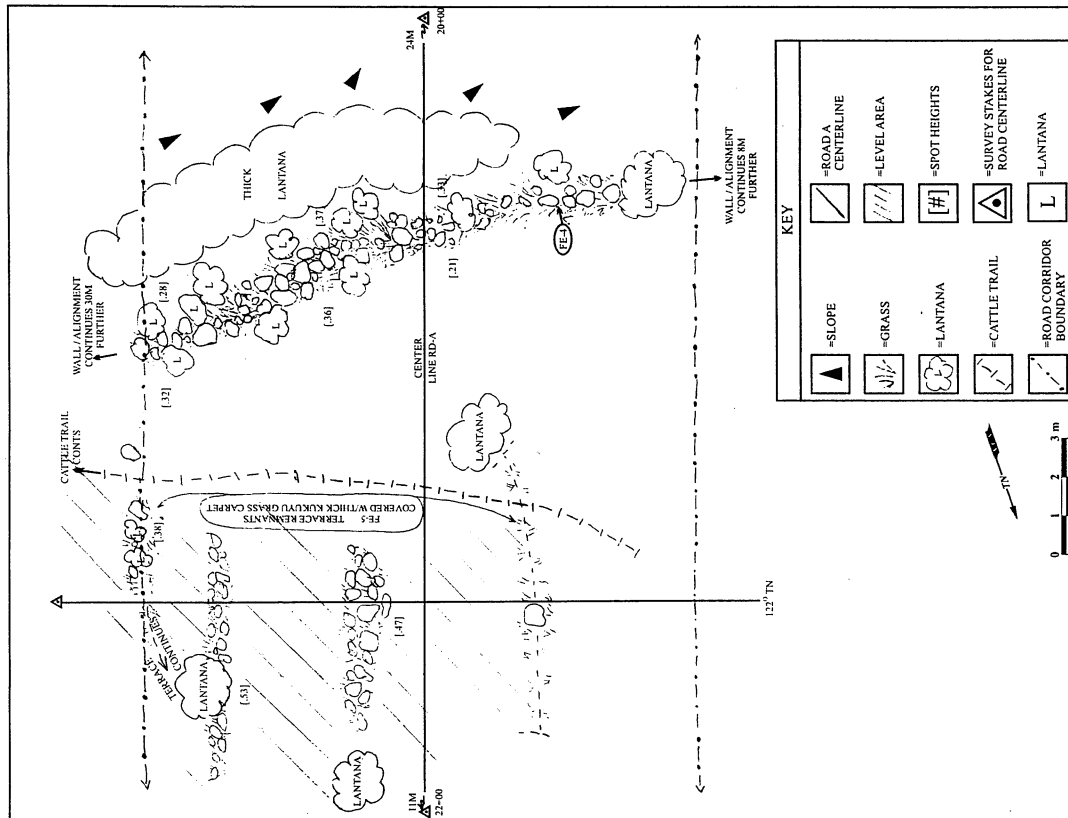


Figure 21: Road A, Site -3280, Feature 4 and 5 Plan View Map.

stacked 3-5 courses high, attaining a maximum height of 1.10 m. The wall measures over 1000.0 m long and averages 1.0-1.5 m wide. Facing is present along portions of both wall flank surfaces. Sections of the wall have been partially tumbled due to animal and mechanical disturbance. No test units were excavated at this feature.

SITE -3263 FEATURE DESCRIPTION

Located in a small swale at the base of a small *pu u*, Site -3263 (Kolb *et al.* 1997:A-208-210) is composed of three previously recorded features (Feature E-1, L-1, and MO-1) that occur within Road E. The site is covered by thick vegetation, including *'ilima*, lantana, and shrubs. Feature E-1 is a square enclosure measuring 10.5 m by 9.5 m (99.75 m²) with a wall thickness of 1.1 m (Figure 23). An opening measuring 1.7 m is located within the south facing wall of the habitation enclosure. Constructed of medium to large cobbles, the walls are stacked 1-2 courses high attaining a maximum height of 0.53 m above the surface. Sections of the enclosure have been partially tumbled due to animal disturbance and vegetation overgrowth. This feature was tested during Inventory Survey. No additional test units were excavated during this project.

Feature L-1 is an L-shaped terrace interpreted as a habitation locale (Kolb *et al.* 1997:A-208). The feature measures 8.0 m by 3.0 m (24 m²) with a wall thickness of 0.50 m to 1.0 m (Figure 24). Abutting a small (1.0 m) modified outcrop on one end, the L-shape is constructed small to large cobbles stacked 2-4 courses high. The long axis of the feature was constructed perpendicular to the swale in which this feature is located. The long arm is slightly terraced, with the gradient proceeding against the natural slope of the terrain. Portions of this long arm are faced and attain a maximum height of 0.76 m on the down slope side of the terrace. Animal disturbance and thick vegetation (*'ilima*) have slightly altered original feature construction. A small terrace remnant was observed approximately 11.0 m down slope (northwest) of Feature L-1. Measuring 3.5 m long and 0.35 cm high, this small terrace was also constructed perpendicular to the swale. No test units were excavated in Feature L-1.

Feature MO-1 is a modified outcrop interpreted as an agricultural feature (Kolb *et al.* 1997:A-208,210). The feature measures 5.0 m long by 0.50-0.75 m wide (see Figure 23). Composed of small to medium cobbles stacked 1-2 courses high on a bedrock outcrop, the feature measures a variable 0.40-0.70 m high. Constructed perpendicular to the slope, this feature has been slightly altered by animal disturbance and vegetation overgrowth. No test units were excavated at this feature.

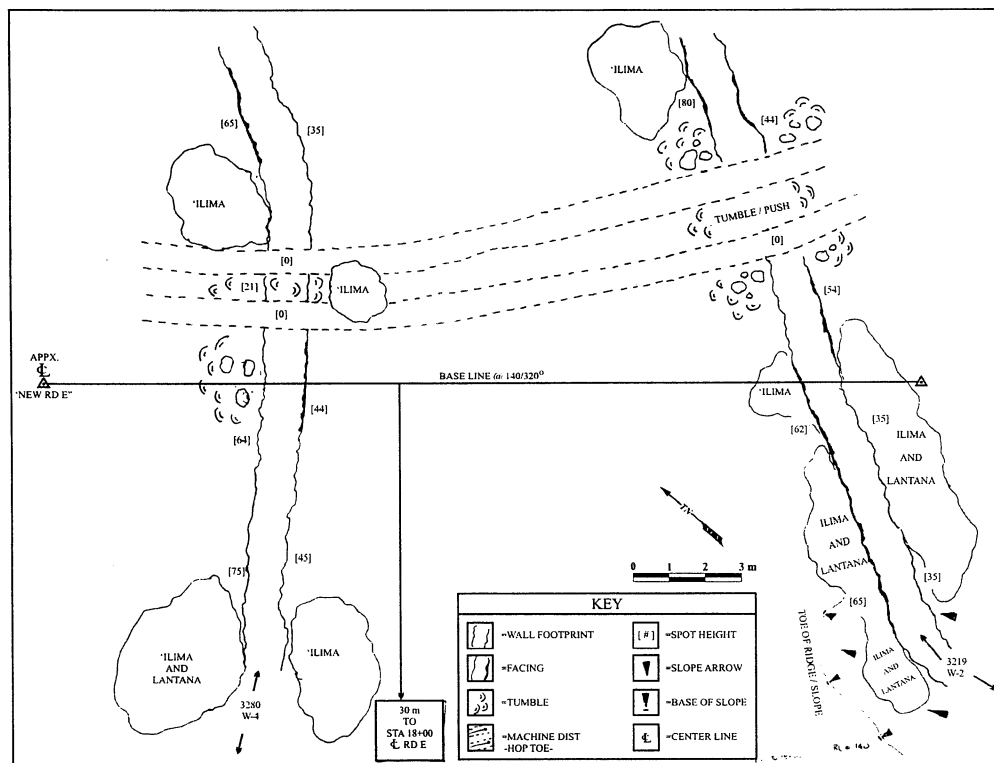


Figure 22: Road E, Site -3280 (W-4) and Site -3219 (W-2) Plan View Map.

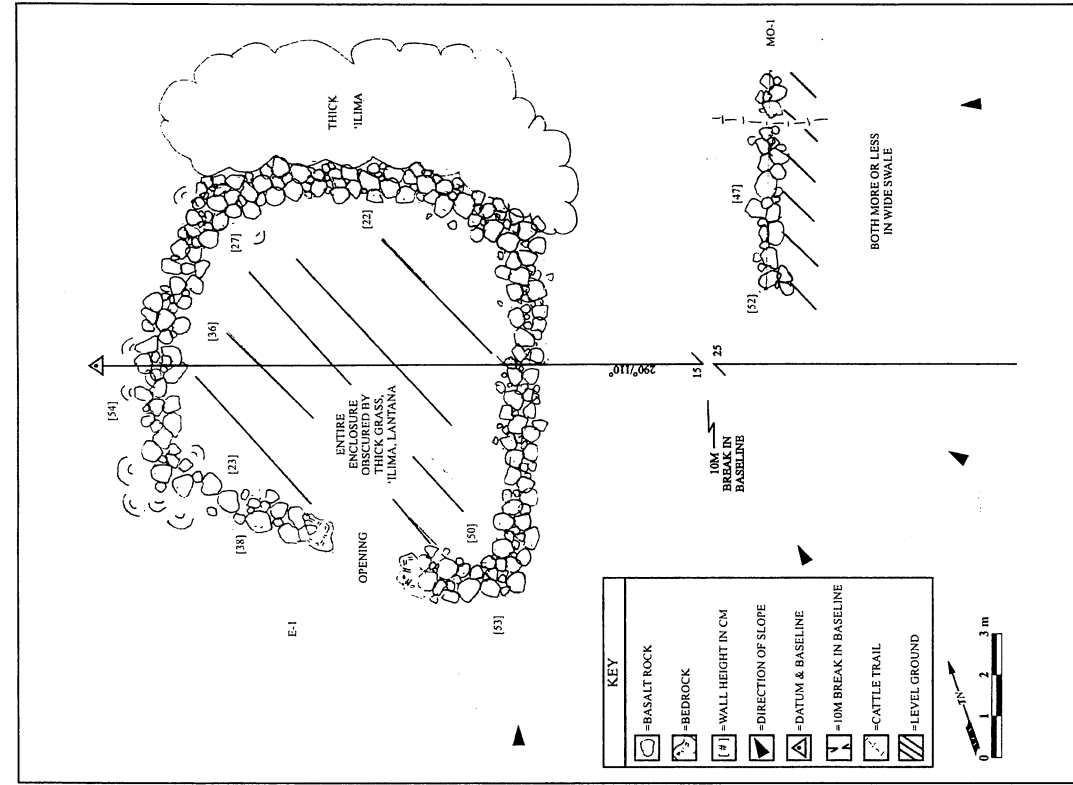


Figure 23: Road E, Site -3263, Feature E-1 and MO-1 Plan View Map.

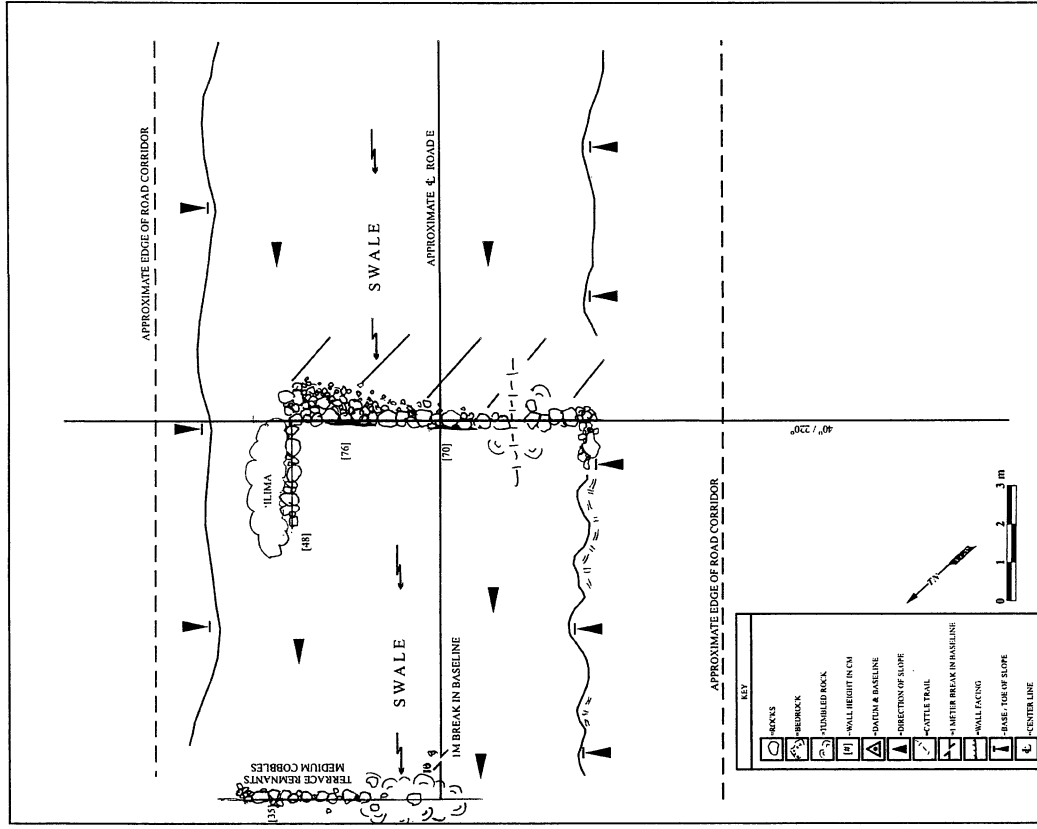


Figure 24: Road E, Site -3263, Feature L-1 Plan View Map.

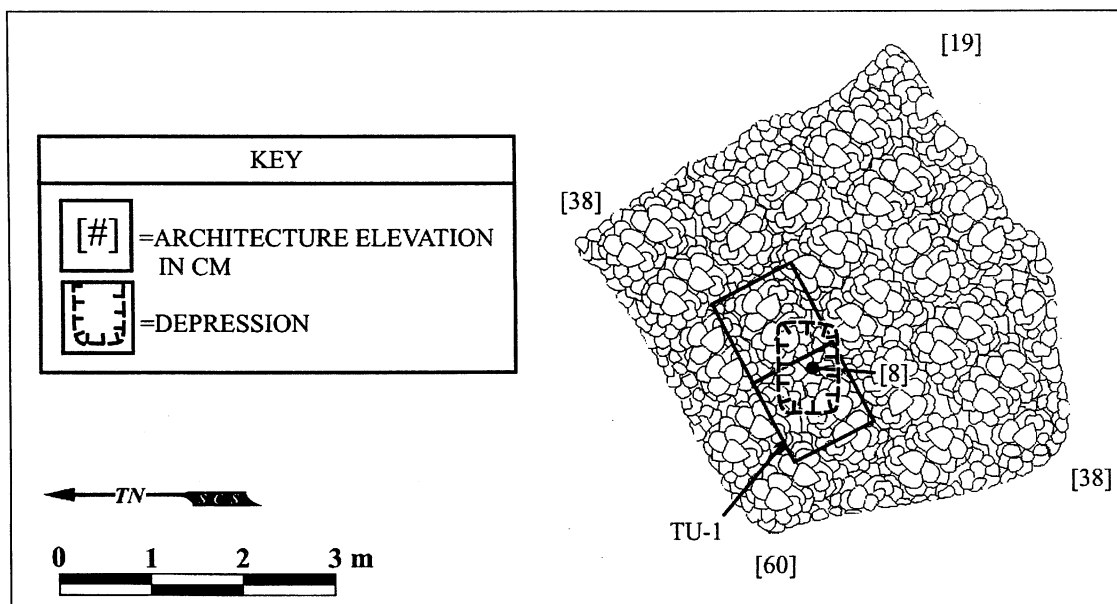


Figure 25: Road E, Site -3263, Feature P-1 Plan View Map.

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SITE -3267 FEATURE DESCRIPTION

Located on a gentle slope, Site -3267 P-1 is a square platform (Figure 25). The habitation feature was previously mapped and recorded but not subject to testing (Kolb *et al.* 1997:A-215). The feature measures 4.5 m by 4.5 m (20.25 m²). The platform is constructed of medium to large cobbles and small boulders stacked 3-6 courses high. The interior is cobble filled. Measuring 0.19-0.60 m high, portions of the feature are faced. A depression is located in the northwest corner of the feature. This feature was tested during the present research. One test unit was positioned over the depression on the feature's surface. A small amount of charcoal was recovered from the excavation unit. Though no other cultural materials were observed, only a small portion of the platform was tested. The evidence in hand suggests this feature to be associated with habitation.

SITE -3267 EXCAVATION

Test Unit 1 (TU-1)

One test unit (TU-1), measuring 1.0 m by 2.0 m, was excavated in Feature P-1. The test unit was positioned in the northwest corner of the feature, approximately 0.50 m from both the north and west walls. This unit also surrounded a noticeable depression located in this corner. After removing portions of the cobble architecture, four stratigraphic layers were exposed (Figure 26). Feature architecture was observed extending into the top of Layer II. Layer I (0.10 m thick) was composed of dark reddish brown (5YR 3/2) silt with small pebbles and few fine roots. No cultural materials were observed within this layer. Layer II (0.30 m thick) was composed of black (5YR 2.5/1) silt loam with medium to fine roots. Cobbles comprised 30 percent of the matrix. Small areas of oxidized soil and ash were seen throughout the western half of the unit. Along with small amounts of charcoal that were collected from this layer, these areas were determined to be part of a root burn. Layer III (0.12 m thick) was composed of dark brown (7.5YR 3/3 to 7.5YR 3/2) sandy silt loam with 65 percent pebbles, cobbles and boulders throughout. No cultural materials were recovered from this layer. Layer III terminated upon natural bedrock in the eastern portion of the unit. Layer IV (0.18 m thick) was composed of very dark gray (5YR 3/1) silt loam with many fine roots. Small boulders and cobbles comprised 40 percent of the matrix. Layer IV was located directly beneath Layer II in the western half of the test unit. Portions of the root burn (oxidized soil and ash) were seen penetrating into this unit from above. No cultural materials were observed within this layer.

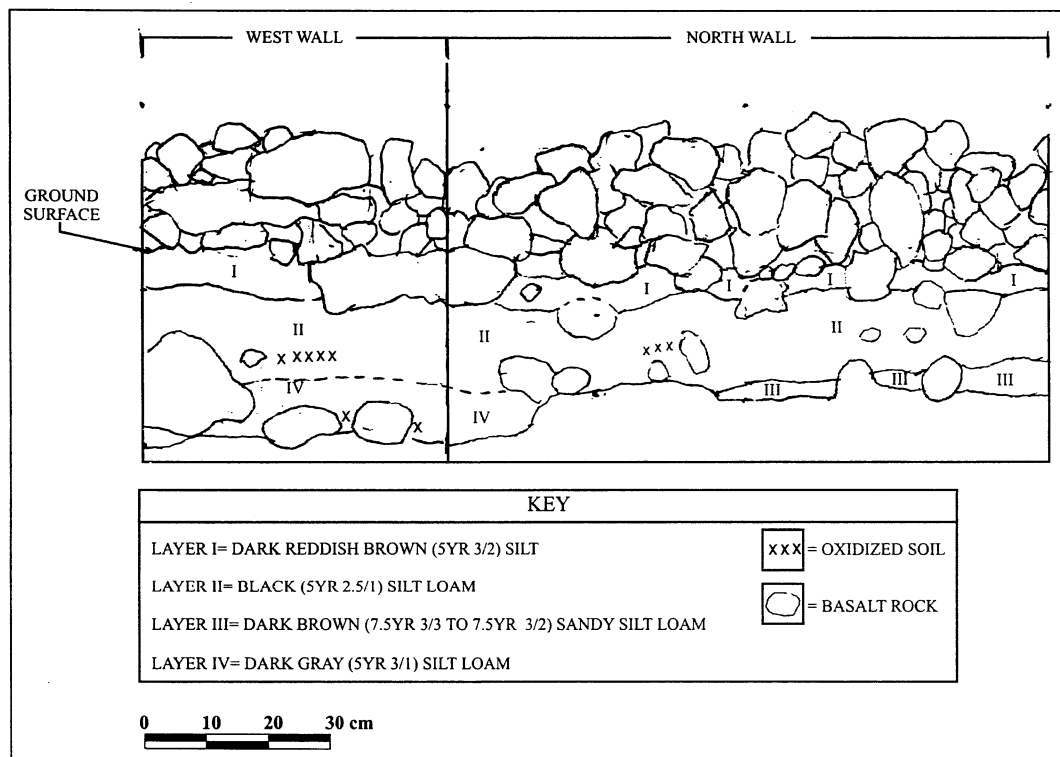
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Charcoal (15.7 g) was collected from Layer II of TU-1. Viewed along with the small amount of oxidized soil and ash seen within this layer, it was determined to be part of a root burn.

Site -3224 L-1 is an L-shaped structure interpreted as a habitation locale (Kolb *et al.* 1997:A-103). Vegetation surrounding the feature consists of lantana and wattle. This feature was re-mapped during the current work (Figure 27). No testing was done as part of this revised research. The feature measures 12.0 m by 6.5 m (78 m²) with a wall thickness of 1.0-2.0 m. This feature was constructed of medium to large cobbles stacked 2 courses high. Facing is present on portions of the wall interior. The exterior wall height ranges from 0.15-0.45 m above the surface while the interior wall height measures 0.40-1.10 m above the prepared interior surface. A small notch (0.80 m by 0.40 m) is located near the center of the wall's interior face. Approximately 2.0 m from this notch, in the interior face, is a small 0.40 m by 0.40 m void wherein either a portion of rock was disturbed from the location or the "void" represents an internal feature. No cultural materials were collected from the surface and no test units were excavated at this feature.

Feature 1 (Site -3280) consists of a small rectangular habitation platform located on a slope of a low ridge, just north of a small swale. The platform is present 3 m off the road right-of-way on a proposed house lot. The surrounding area is covered in thick vegetation (including *ilima*, lantana, and grasses). This feature was not recorded during Inventory Survey (Kolb *et al.* 1997) and was mapped and recorded during the present phase of work (Figure 28). The feature itself measures 4.75 m by 3.0 m (14.25 m²). Stacked 2-3 courses high, the platform is constructed of small to medium cobbles with a few large cobbles throughout. The height of the feature ranges from 0.08 m (on the up slope flank) to 0.71 m (on the down slope flank). A possible upright, measuring 0.62 m high, is located along the northwest edge of the platform. The feature has been altered by animal disturbance and vegetation overgrowth. As this particular feature occurs outside the road corridor, no testing was performed. This feature will likely be preserved.

Feature 2 (Site 3280) was not recorded during Inventory Survey and consists of a culturally modified rock shelter with three small walls extending perpendicular from the overhang (Figure 29). The shallow overhang measures 8.0 m long and 0.54–0.87 m high. Three



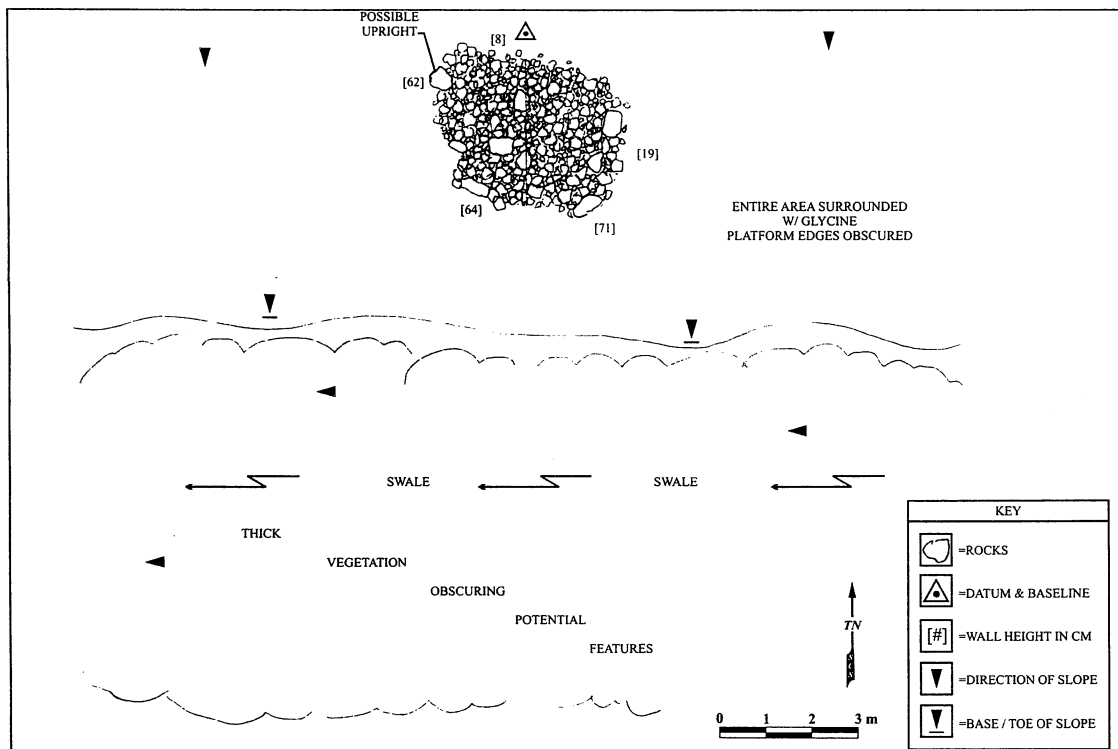


Figure 28: Road E, Site -3280, Feature 1 Plan View Map.

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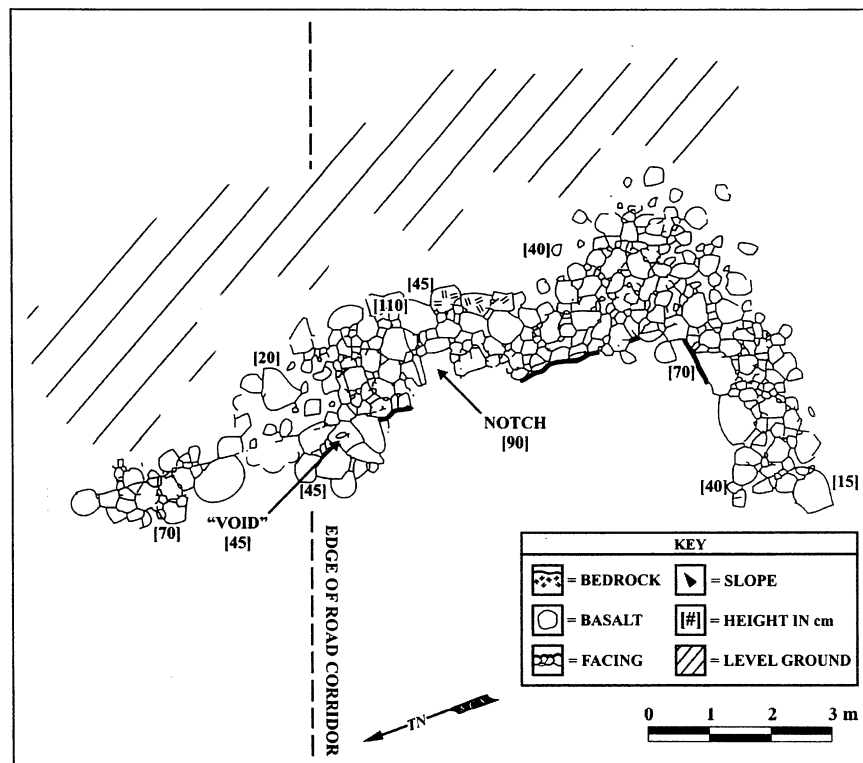


Figure 27: Road E, Site -3224, Feature L-1 Plan View Map.

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small walls (0.50 m to 2.5 m long) extend out from the overhang, one of natural bedrock and two walls of 2-3 course-stacked medium to large cobbles (0.39-0.98 m above the surface). Located on the south side of small draw, this feature is interpreted as a windbreak or small secular food preparation area. No test units were excavated within this feature.

ROAD E, FEATURE 3 DESCRIPTION

Feature 3 (-3280) was not recorded during Inventory Survey and consists of an irregular-shaped platform located at the base of a slope. This feature was mapped, recorded, and tested during the current project (Figures 30 and 31). The feature measures 2.5 m by 2.5 m (6.25 m²). Constructed of medium to large cobbles stacked 2-3 courses high, the platform measures 0.22-0.53 m high along its perimeter. The interior of the feature is filled with small to large cobbles and is slightly mounded in the center. Small portions of the feature have been disturbed by animals and vegetation. TU-1 was excavated within the interior of Feature 3. One test unit was placed in the center of the platform and yielded cultural material from both Layers I and II, though material was only collected from the top 0.10 m of Layer II. Traditional artifacts (basalt debitage and flakes with polish), charcoal, marine shell, and faunal bone were recovered from this test unit. The presence of these cultural materials suggests that this feature was utilized as prehistoric habitation locale.



Figure 30: Road E, Site -3280, Feature 3 Overview, View to East.

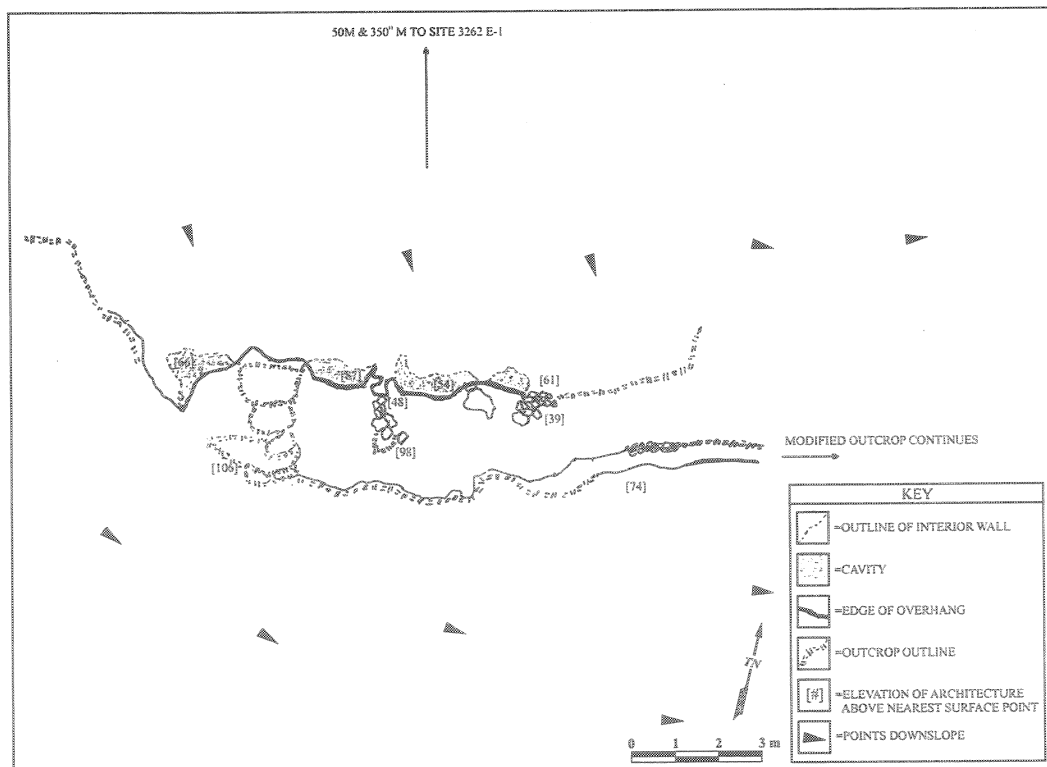


Figure 29: Road E, Site -3280, Feature 2 Plan View Map.

ROAD E, FEATURE 3 EXCAVATION

Test Unit 1 (TU-1)

One test unit (TU-1), measuring 1.0 m by 1.0 m, was positioned in the center of the platform to examine feature architecture and to test for the presence/absence of cultural material. Platform architecture was constructed from small to large cobbles and measured 0.18-0.22 m thick, extending into Layer I. The partial removal of this architecture exposed three stratigraphic layers (Figure 32). Layer I (0.04-0.20 m thick) was composed of black (5YR 2.5/1) fine silty loam with 30 percent small to medium cobbles. A few traditional artifacts (basalt debitage and flakes with polish), charcoal, marine shell, and faunal bone were collected from this layer (see below). Layer II (0.10-0.30 m thick) was composed of dark reddish brown (5YR 3/2) semi compact silt with 30 percent small to large cobbles. A thin (0.02-0.06 m thick) ash lens was observed in the southern portion of the test unit, approximately 0.10 m below the Layer II surface. A small amount of traditional artifacts (basalt debitage), charcoal, land snail, and faunal bone were collected within Layer II above the ash lens. No cultural materials were collected below this lens in Layer II. Layer III (0.03-0.05 m thick) was identified as a saprolitic layer composed of reddish brown (5YR 4/4) silt loam resting upon naturally decaying bedrock. No cultural materials were observed within this layer.

Invertebrates

Fragments of *Cellana* sp. and Echinoidea were recovered from Layer I within TU-1. The presence of these marine species several miles from the coast indicates their introduction into the site by humans, presumably as food items. Fragments of *Amastra hutchinsoni*, *Amastra cylindrical*, and *Amastra nucleola* were recovered from Layer II in TU-1. These are three species of indigenous arboreal land snails.

Artifacts

Traditional artifacts were limited to basalt debitage in TU-1. Four pieces of basalt debitage along with three basalt flakes with polish were recovered from Layer I. Excavation led to the recovery of two pieces of basalt debitage from the top 0.10 m of Layer II.

Charcoal

Small amounts of charcoal (3.8 g) were collected from Layer I in TU-1. Slightly more was collected with the surrounding matrix (15.7 g) in Layer II.

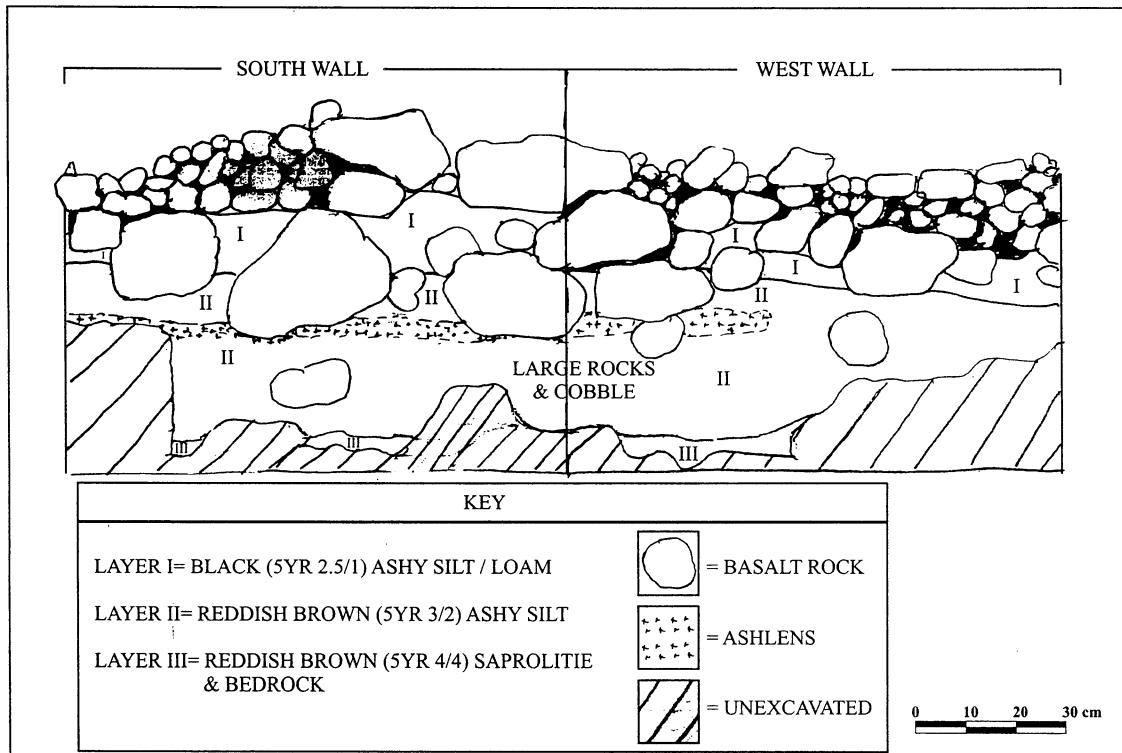


Figure 31: Road E, Site -3280, Feature 3 Plan View Map.

Vertebrates

Sus scrofa and bird remains were recovered from Layer I of TU-1. *Sus scrofa* and *Gallus gallus* remains were recovered from the top 0.10 m of Layer II. Both of these species were pre-historically introduced as food items.

ROAD E, FEATURE 4 DESCRIPTION

Feature 4 (-3280) is a small rounded platform measuring 1.6 m by 1.6 m (2.56 m²) and located at the bottom of a small grassy swale below two low ridges. Thick vegetation, including *lantana*, *ilima*, *panini*, and balloon plant cover the feature and surrounding area. Previously undocumented during Inventory Survey, this feature was mapped, recorded, and tested during the present project (Figure 33). The platform was constructed of medium and large cobbles stacked 1-2 courses high (0.11-0.35 m). Portions of the feature have been tumbled due to animal disturbance and vegetation overgrowth. One test unit was excavated in the feature and encompassed approximately two-thirds of the platform surface. No cultural materials were recovered from this unit. This dearth of cultural materials could be indicative of an agricultural feature. However, this feature could be associated with habitation. A pattern that will be explored later is that some of the sites/features constructed in the area were constructed late (c. A.D. 1780s/1800) and do not contain many cultural materials as they were only occupied for a very brief time, if at all, after construction. This pattern is in keeping with the radiocarbon dates for Kula showing a precipitous drop in population and site construction during this time period.

ROAD E FEATURE 4 EXCAVATIONS

Test Unit 1 (TU-1)

One test unit (TU-1), measuring 1.0 m by 1.0 m, was excavated in Feature 4. The test unit was positioned over the eastern 2/3 of the platform. After removing portions of the cobble architecture (0.10-0.15 m thick), two stratigraphic layers were exposed (Figure 34). Layer I (0.35-0.40 m thick) was composed of very dark brown (10YR 2/2) semi-compact silt. Cobbles comprised 70 percent of the matrix. No cultural materials were recovered in this layer. Layer II (0.01-0.05 m thick) consisted of a saprolitic layer comprised of dark reddish brown (5YR 2.5/2), semi-compact silt overlying naturally decaying bedrock. Pebbles and cobbles comprise 60-70 percent of the matrix. No cultural materials were recovered from this layer.

ROAD F RESULTS

ROAD F SUMMARY

Several features associated with known sites were documented along Road F (see Figure 3). Several features at Sites -3280 and -3272, sites previously identified during Inventory

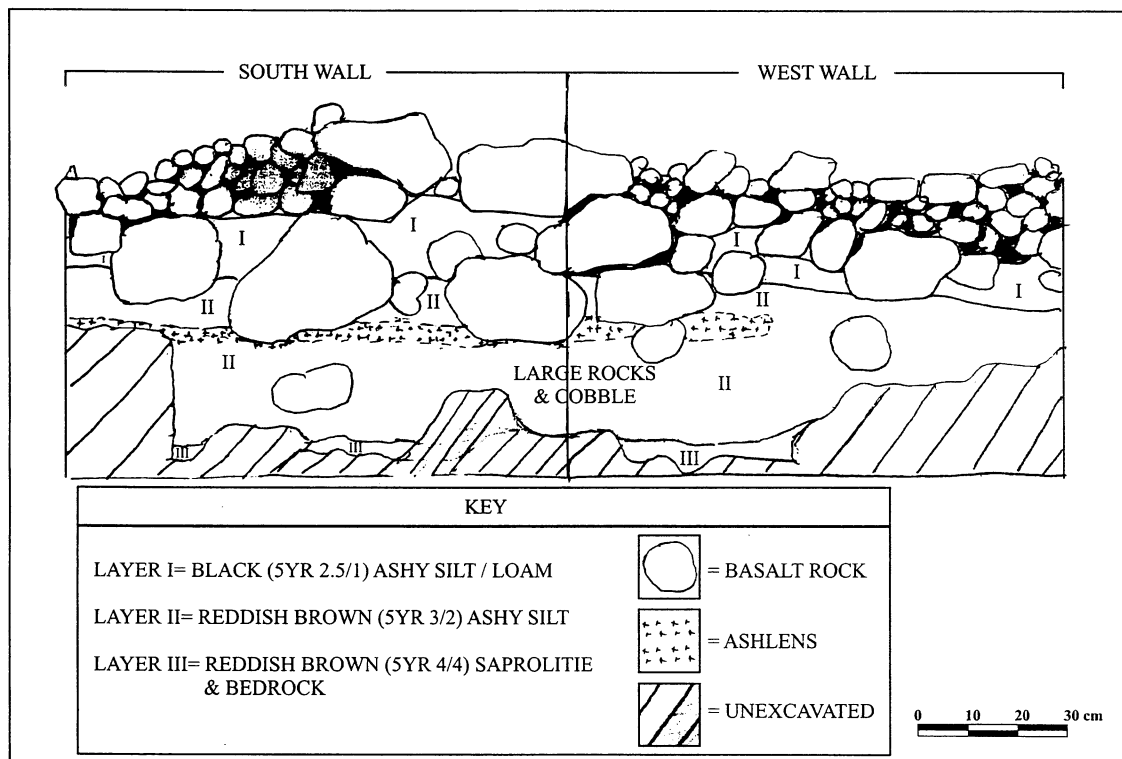


Figure 32: Road E, Site -3280, Feature 3, TU-1 Profile.

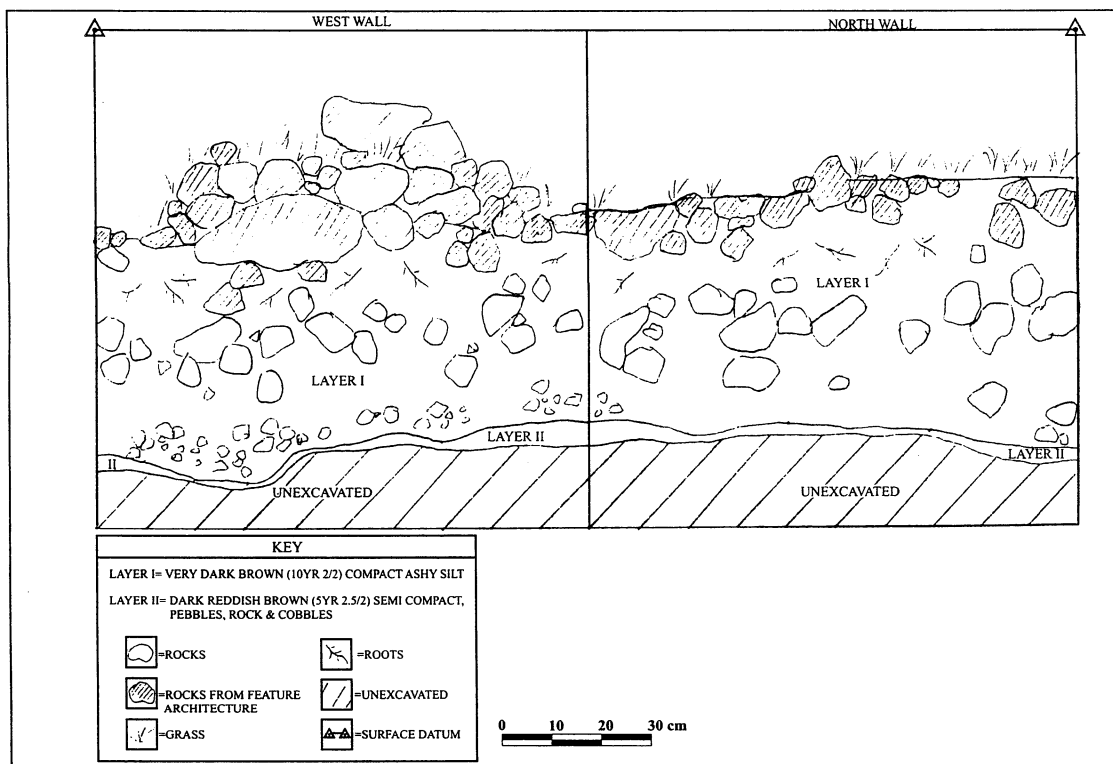


Figure 34: Road E, Site -3280, Feature 4, TU-1 Profile.

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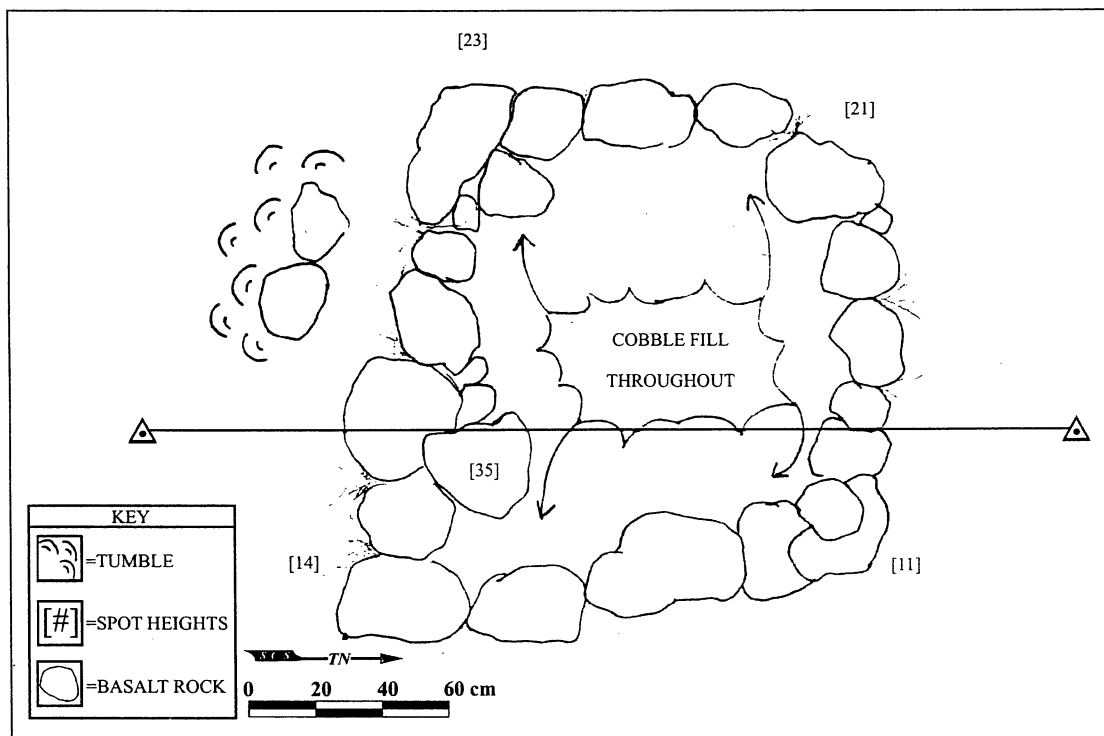


Figure 33: Road E, Site -3280, Feature 4 Plan View Map.

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Survey, were recorded. One newly identified structure (Feature 1) was recorded during the revised survey. This feature has been associated with Site -3272.

Site -3280, documented by Kolb *et al.* (1997), included three features (W-16, LT-1, and ET-1) that occur within the Road F corridor. All three features were partially disturbed by natural erosion, animal disturbance, and thick vegetation (*lantana*, *panini*, and grasses). Feature W-16 was identified as a boundary wall. This feature was re-mapped but not subject to testing. Feature LT-1 was identified as a modified lava tube used as a storage area. This feature was re-mapped but not subject to testing. Feature ET-1, located a few meters away from Feature LT-1, was originally identified as an irregular enclosed terrace. During relocation of the feature, the enclosed portion of the terrace was not observed. The feature appears to only consist of four terrace walls and one modified outcrop. Feature ET-1 was re-mapped and one test unit was excavated. Excavation led to the recovery of a basalt core and one piece of basalt debitage. The absence of any other cultural materials and the type of architecture recorded (terraces) suggests this site was probably not utilized for habitation but for agricultural pursuits.

Located along a natural knoll, site -3272 P-1 was originally identified as an irregular platform (Kolb *et al.* 1997:A-231). However, when the feature was relocated during the present survey it was reassessed as a C-shape structure. Altered by animal disturbance and natural erosion, the site was remapped and two test units were excavated within the C-shape. Cultural materials recovered from the units included charcoal, marine shell, traditional artifacts (basalt and volcanic glass debitage), and faunal remains. The presence of these materials, as well as the presence of two subsurface features (a post mold and hearth), suggest that this feature was used as a traditional-period habitation loci.

Road F Feature 1 (Site -3272) was not recorded during original Inventory Survey of the parcel. The feature consists of an irregular-shaped platform/mound. Located on the upper portion of an undisturbed slope, the area was covered in thick vegetation (including *panini*, *lantana*, and grasses). Interpreted as a habitation locus, Feature 1 was mapped and one test unit was placed within the platform. During excavation, an *in situ* human burial was identified (see below). Cultural materials (possible adze fragments, adze preform, basalt debitage, and charcoal) observed within this test unit were not collected and were re-interred when the unit was backfilled with soil to protect the remains *in situ*. Feature construction, the recovery of traditional artifacts, and the lack of historic materials suggest that this site is associated with traditional pre-Contact times. More in-depth interpretations may be available if the burial is re-located outside the road corridor.

SITE -3280 FEATURE DESCRIPTION

Feature W-16 is a linear wall (Kolb *et al.* 1997:A-275, -276). This feature measures 27.2 m long and approximately 0.60 m wide. Wall height ranges from 0.60 m to 1.2 m and is constructed of 3-4 courses of stacked medium to large cobbles atop bedrock outcrop (Figure 35). Thick vegetation (*lantana*, *panini*, grasses) and animal disturbance have partially altered the original architecture. No cultural materials were observed on or around the feature. No test units were excavated within Feature W-16.

Feature LT-1 is a modified lava tube (Kolb *et al.* 1997:A-261, -262). This feature measures approximately 24.0 m by 3.5 m with a maximum interior height of 0.50 m (Figures 36 and 37). The outcrop around the lava tube entrance has been modified with roughly stacked medium to large cobbles. Animal disturbance and natural erosion have slightly altered this feature. No cultural materials were observed on the surface of the feature. No test units were excavated within Feature LT-1.

Feature ET-1 was originally identified as an irregular enclosed terrace (Kolb *et al.* 1997:A-256). The feature was supposedly composed of three enclosed terraces. During relocation of the site, these enclosed terraces were not observed. However, the site this new data shows that the feature is comprised of four terrace walls and one modified outcrop (see Figure 36). One L-shaped terrace was located 9.0 m north (0 degrees) from the opening's north/northwest corner of Feature LT-1. Measuring 8.0 m by 5.2 m (41.6 m²), the terrace averaged 1.4 m wide. The feature ranged in height from 0.30-0.60 m. A second terrace, located approximately 2.0 m north/northwest of the first, was constructed in a slight curve, measuring 16.0 m long and 1.0 m wide. Terrace height ranged from 0.25-0.30 m. Located 6.0 m west of the first terrace, a third terrace feature was constructed. This feature measured approximately 10.0 m long with a slight curve to its construction. With a width of 0.50 m, the feature measured 0.35-0.40 m high. The end of this terrace is less than a meter north of a modified outcrop. This modified outcrop measures 8.2 m long and 0.20-0.50 m wide. Located 3.0 m southwest of the first terrace feature is a fourth terrace. Measuring 5.0 m long and 0.40 cm wide, the constructed height ranges from 0.30 m to 1.0 m. Though slightly altered by animal disturbance and thick vegetation, construction of all five terraces was composed of 2-3 courses of stacked medium to large cobbles. Facing was present on portions of terraces. One stratigraphic trench (ST-1) was excavated within this site.

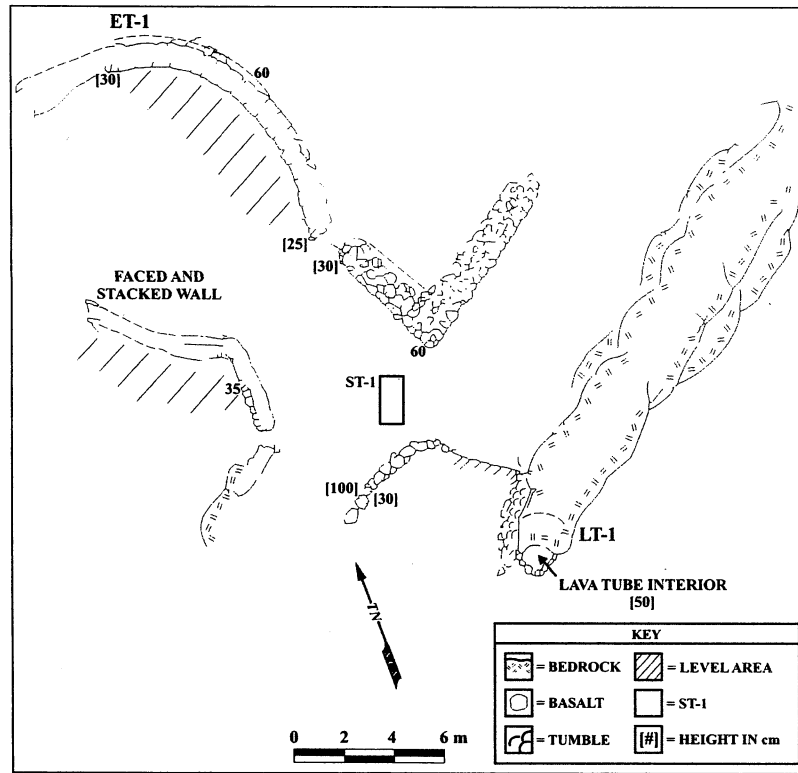


Figure 36: Road F, Site -3280, Feature ET-1 and LT-1 Plan View Map.

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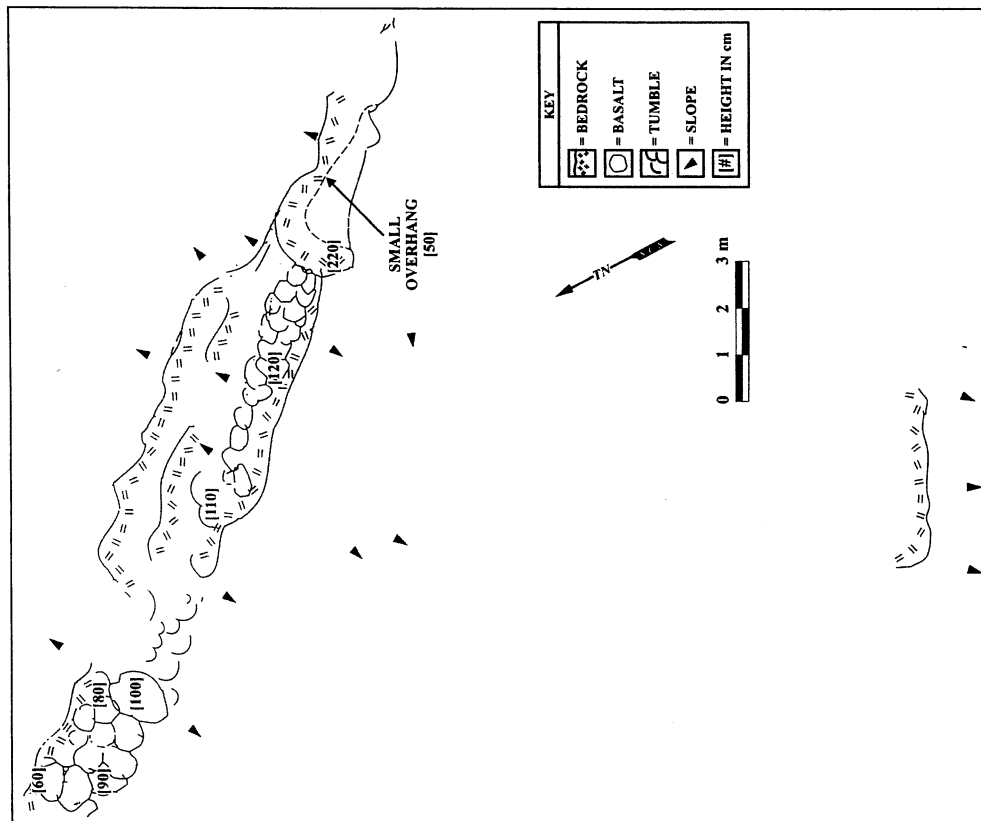


Figure 35: Road F, Site -3280, Feature W-16 Plan View Map.

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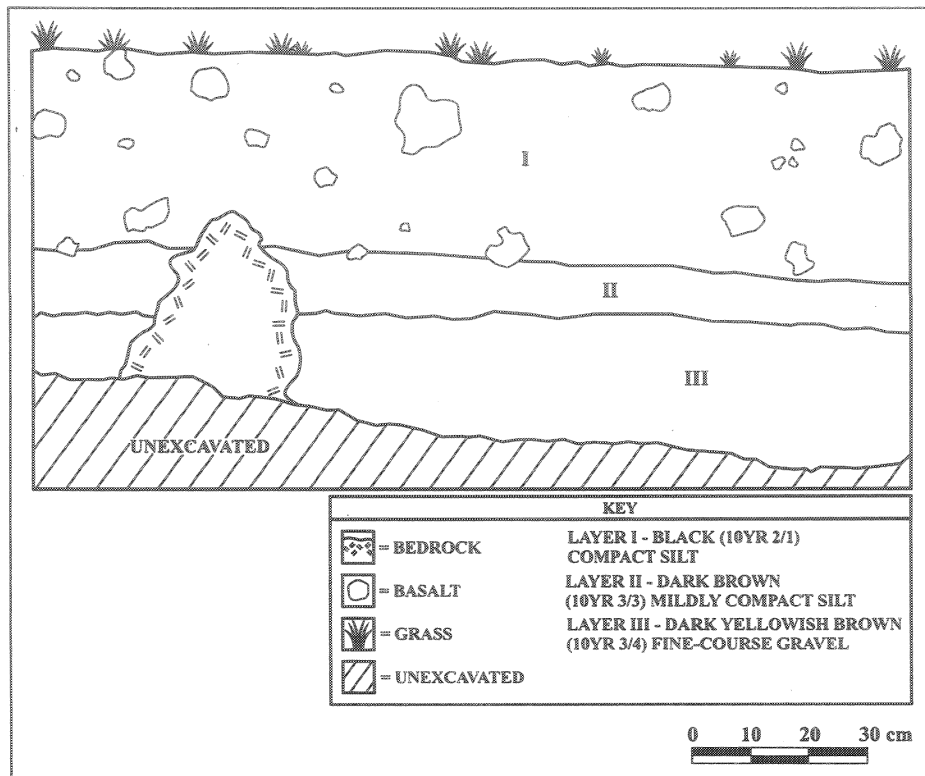


Figure 38: Road F, Site -3280, Feature ET-1, ST-1 West Profile.

67

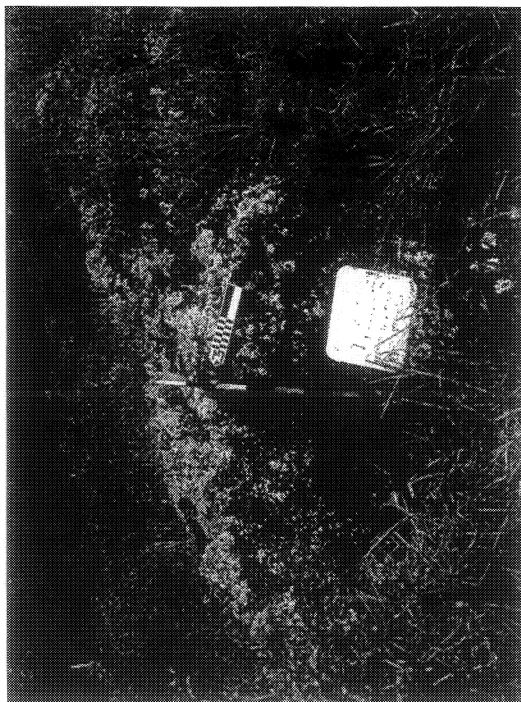


Figure 37: Road F, Site -3280, LT-1, View to East.

SITE -3280 EXCAVATION

Stratigraphic Trench 1 (ST-1)

One stratigraphic trench (ST-1), measuring 2.0 m by 1.0 m, was excavated in Feature ET-1. Located 1.0 m southwest of the first terrace, ST-1 was placed in a level area of the site. Excavation revealed three stratigraphic layers (Figure 38). Layer I (0-0.35 mbs) was composed of black (10YR 2/1) compact silt with small to large cobbles throughout. Two traditional artifacts (basalt debitage and a basalt core) were collected from this layer. Layer II (0.32-0.43 mbs) was composed of dark brown (10YR 3/3) mildly compact silt with small cobbles throughout. No cultural materials were recovered from this layer. Layer III (0.43-0.65 mbs) was identified as a saprolitic layer composed of dark yellowish brown (10YR 3/4) silt with small to medium cobbles throughout. Ending on the natural bedrock, no cultural materials were observed within this layer.

Artifacts

One basalt core and one piece of basalt debitage were collected from Layer I of ST-1. Though only a small portion of this area was tested, the limited presence of cultural material and

the absence of any other cultural material suggest that this was not a habitation site but rather related to agriculture.

SITE -3272 FEATURE DESCRIPTION

Feature P-1 was originally identified as an irregular platform (Kolb *et al.* 1997:A-231). However, after clearing and re-mapping of this site, the feature appears to be a C-shape (Figure 39). The feature measures 9.0 m by 9.0 m (81 m²) and the sloped terrace walls range in thickness from 1.5-2.0 m. Composed of 5-7 courses of stacked medium to large cobbles, wall heights varied from 0.40 m to 1.2 m above the surface. Facing was present in a portion of the northwest interior wall. The feature interior was a level soil surface. Two test units (TU-1 and TU-2) were excavated in Feature P-1.

SITE -3272 EXCAVATION

Test Unit 1 and 2 (TU-1 and TU-2)

TU-1, measuring 1.0 m by 1.0 m, was excavated along the northwest interior wall of Feature P-1. The test unit was positioned within the feature to examine wall architecture and to test for the presence/absence of cultural material. Two stratigraphic layers were exposed during excavation (Figure 40). Layer I (0-0.85 mbs) was composed of a dark reddish brown (5YR 3/2) fine silt with many roots. Pebbles to large cobbles comprised 35 percent of the matrix. Feature architecture extended to 0.35 mbs, well within Layer I. Cultural materials recovered from this layer included traditional artifacts (basalt and volcanic glass debitage), marine shell, faunal remains, and charcoal (see below). Two subsurface features were identified within Layer I. SSF P-1-1.1 was identified in the northwest corner of TU-1 abutting feature architecture. SSF P-1.1 (0.25-0.46 mbs) was composed of a very fine silt. Measuring 0.30 m in diameter, this subsurface feature was identified as a post hole (Figure 41). The post hole was encased by small boulders, these likely used to brace the post. No cultural materials were collected from within the subsurface feature. SSF P-1.2 was identified in the southeast corner of TU-1 along the south wall. SSF P-1.2 (0.63-0.67/ 0.70-0.78 mbs) was composed of a dark reddish gray (5YR 4/2) ash. Measuring 0.37 m in diameter, this subsurface feature was identified as a cobble-lined hearth (Figure 42). The hearth appears to have two distinct periods of use, with a 0.08 m layer of silt between the two ash layers. The bottom of SSF P-1.2 ends just above (0.02 m) the surface of Layer II. Only charcoal was collected from this subsurface feature. Layer II (0.85-0.96 mbs) was composed of reddish brown (5YR 4/3) very fine silt with few roots. Pebbles and cobbles comprised 30 percent of the matrix. No cultural materials were recovered from this layer. Layer II was terminated upon naturally decaying bedrock.

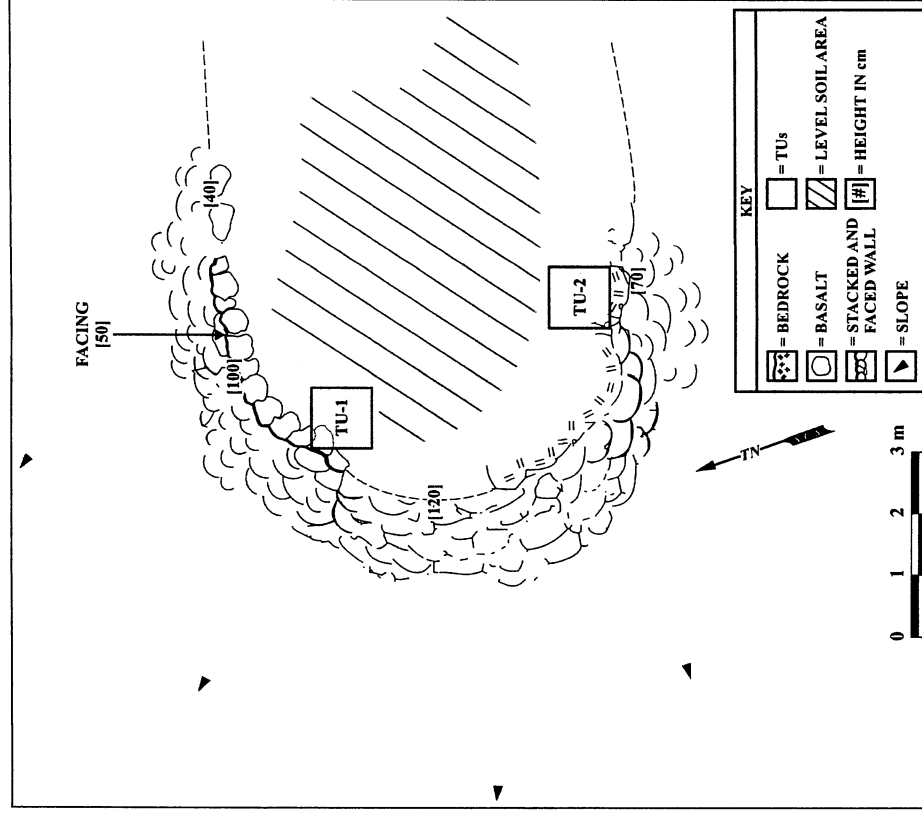


Figure 39: Road F, Site -3272, Feature P-1 Plan View Map.

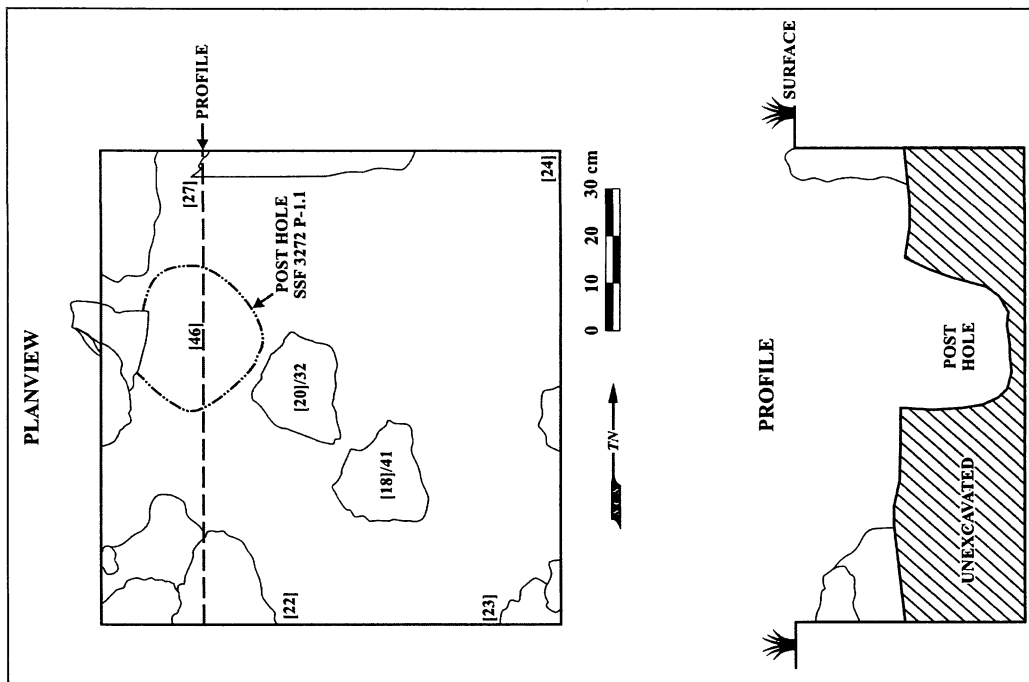


Figure 41: Road F, Site -3272, Feature P-1, SSF P-1.1 Plan View Map and Profile.

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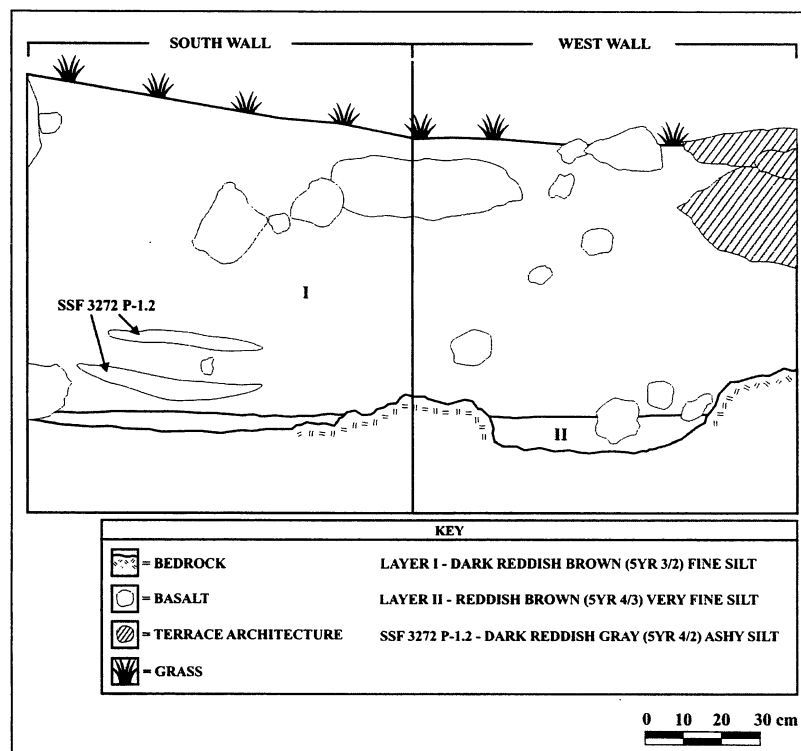


Figure 40: Road F, Site -3272, Feature P-1, TU-1 Profile.

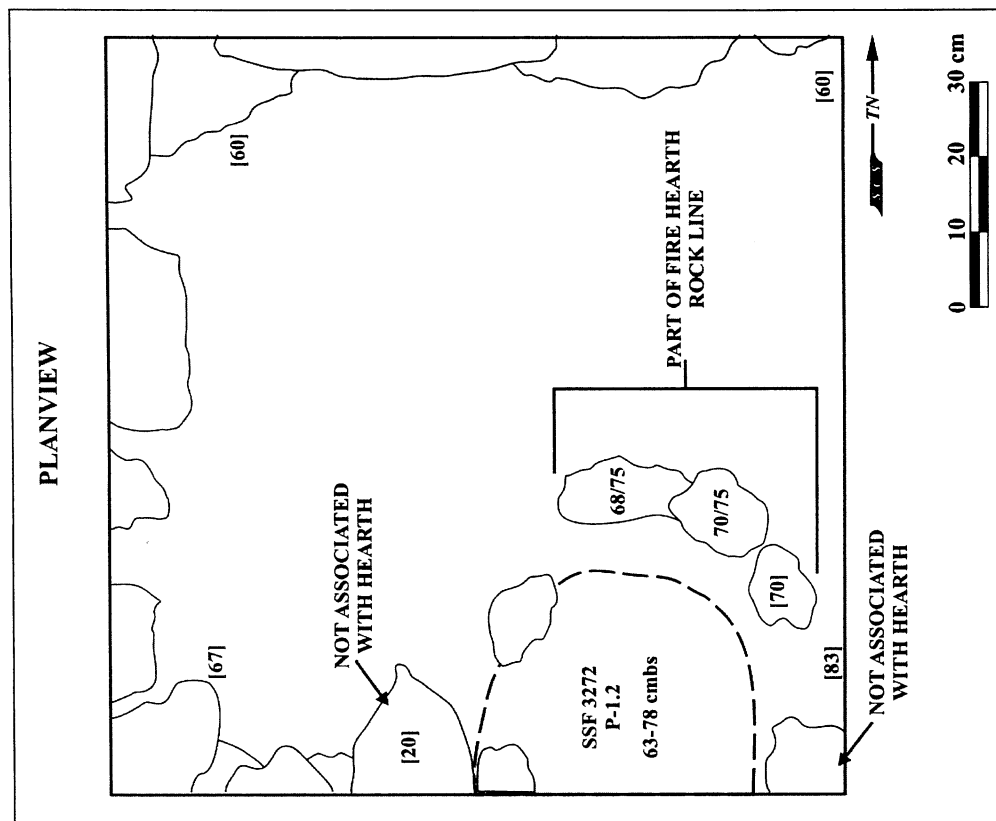


Figure 42: Road F, Site -3272, P-1, SSF P-1.2 Plan View Map.

A second test unit (TU-2), measuring 1.0 m by 1.0 m, was excavated along the interior of the southern wall. Two stratigraphic layers were exposed during excavation (Figure 43). Layer I (0-0.48 mbs) was composed of dark reddish brown (5YR 2.5/2) fine silt. Cobbles and small boulders comprised 35 percent of the matrix. Cultural materials collected in this layer included charcoal and faunal remains (see below). Along the north wall of the test unit, a small lens of oxidized soil (0.47 m diameter) was observed. This lens (0.44-0.52 mbs) was composed of dark reddish brown (5YR 3/4) very fine silt. Cobbles comprised 5 percent of the matrix. No charcoal was associated with this lens and it is probable that the staining is associated with a root burn. Layer II (0.48-0.56 mbs) was composed of dark reddish brown (5YR 3/3) very fine silt and located upon naturally decomposing bedrock. No cultural materials were observed in this layer.

Invertebrates

Fragments of few different species of marine shell were recovered from Layer I (0-0.70 mbs) within TU-1. These included *Isognomon* sp., *Tellina palatani*, *Heterocentrotus mammillatus*, Non-diagnostic Echinoidea, and Decapoda. The presence of these marine species several miles from the coast indicates their introduction into the site by humans, presumably as food items. No invertebrates were collected from TU-2.

Artifacts

Six pieces of volcanic glass debitage and eleven pieces of basalt debitage were collected from Layer I (0-0.70 mbs) in TU-1. No traditional artifacts were recovered from TU-2.

Charcoal

A large quantity of charcoal (103.3 g) was collected from Layer I (0-0.70 mbs) in TU-1. A small amount of charcoal (7.6 g) was collected from within the hearth feature SSF P-1.2 in TU-1. Charcoal (17.1 g) was also collected from Layer I (0-0.48 mbs) of TU-2.

Vertebrates

Rattus/Mus sp. and bird remains were recovered from TU-1 within Layer I (0-0.70 mbs). Elasmobranch and small vertebrate remains were recovered from Layer I (0-0.48 mbs) in TU-2. The presence of *Rattus/Mus* sp. is usually indicative of a probable habitation site as this species is attracted to the presence of food remains. The presence of Elasmobranch, whether used as a food item or not, several miles from the coast, indicates its introduction to the site by humans.

ROAD F, FEATURE 1 DESCRIPTION

Feature 1 is an irregular-shaped platform/mound (Figure 44). The feature measures 3.25 m by 2.25 m (7.31 m²). The feature consists of a platform along its southern half, composed of small to large cobbles stacked 3-4 courses high (0.40-0.60 m above the ground surface). The

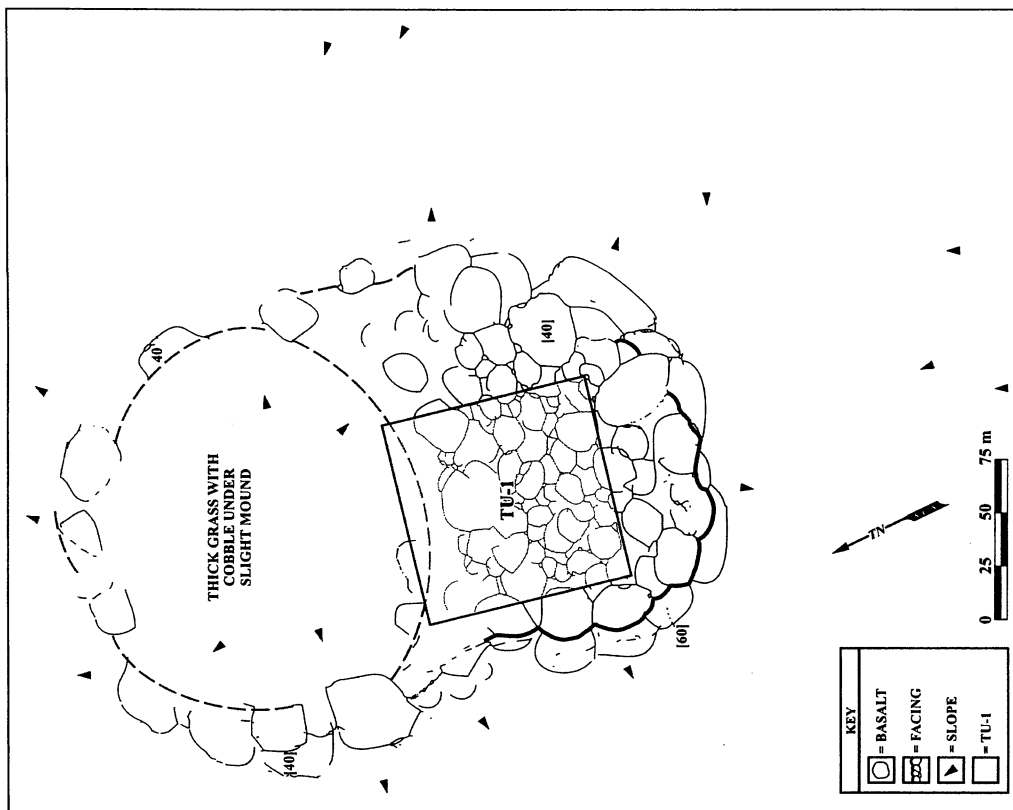


Figure 44: Road F, Feature 1 Plan View Map.

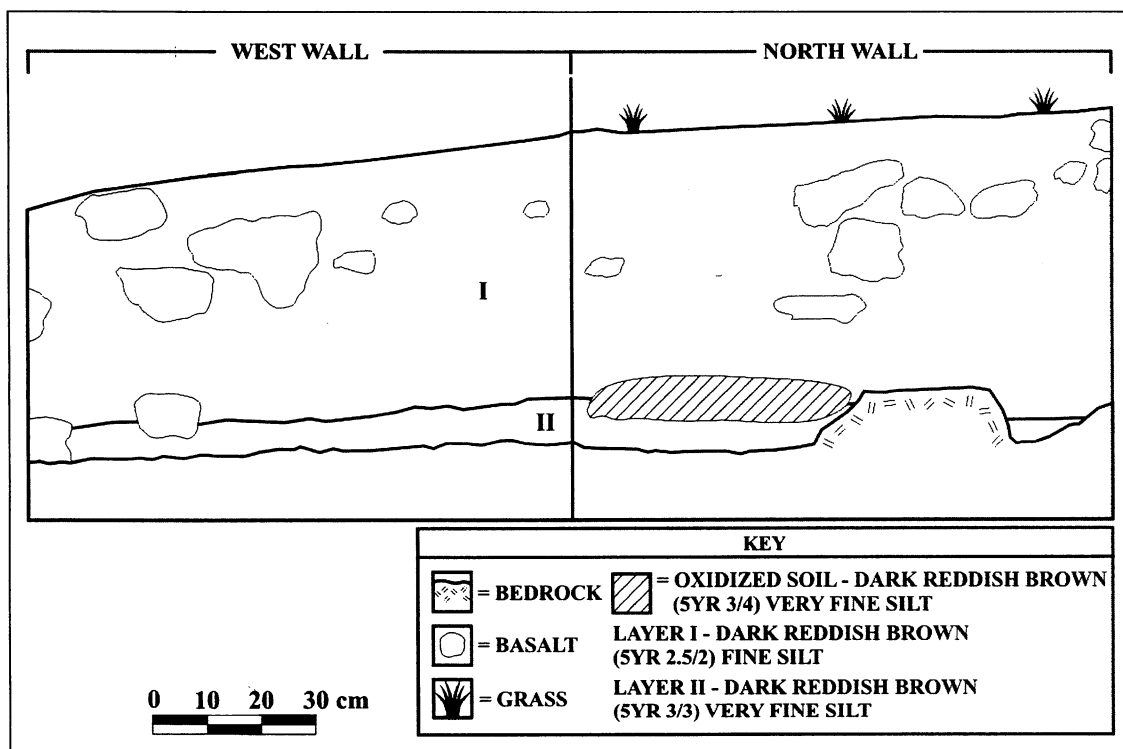


Figure 43: Road F, Site -3272, Feature P-1, TU-2 Profile.

north half of the feature consisted of a mounded construction of cobbles, stacked 1-2 courses along the exterior (0.40 m above ground surface), and now covered in thick grasses. One test unit (TU-1) was excavated within Feature 1.

ROAD F FEATURE 1 EXCAVATION

Test Unit 1 (TU-1)

One test unit (TU-1), measuring 1.0 m by 1.0 m, was excavated within Feature 1. The test unit was positioned within the southern (platform) half of the feature's interior to examine feature architecture and to test for the presence/absence of cultural material. Architecture was observed extending 0.36 mbs, well into Layer I. The architecture was less structured in the northern part of the unit, corresponding with the introduction of the mounding. Two stratigraphic layers were exposed during excavation of this unit (Figure 45). Layer I (0-1.06 mbs) was composed of very dark brown (7.5YR 2.5/3) very fine silt. Pebbles comprised 15 percent of the matrix. A layer of gravel/pebbles mixed with soil was observed in the northern half of the unit between 0.62-0.67 mbs. Traditional artifacts (including basalt debitage, possible adze fragments, and a possible adze perform) and charcoal were observed within this layer. At 0.80 mbs, a human patella was discovered in the southwest corner of the test unit. After following proper procedures on the discovery of an inadvertent burial, excavation was allowed to resume to determine the burial's gender, ethnicity, and position.

A very indistinct pit outline was observed from 0.07-0.22 m, removed from the edge of the skeletal remains beginning at 0.72 mbs. The burial appeared to be an adult female (determined by observation of the angle of the pubic symphysis and the presence of fused/ossified epiphyses) in a supine position. Ethnicity could not be determined due to the lack of cranial features yet the presence of only traditional-period artifacts argues for the remains being associated with a Native Hawaiian. The articulated skeletal remains uncovered in TU-1 include the bones from the pelvis through the top of the right tibia and fibula. The right ulna and radius were also observed. These remains were not removed and excavation was terminated once the remains were confirmed to be human (at 1.06 mbs). Layer II (0.80-0.86 mbs) was composed of dark reddish brown (5YR 3/3) fine silt with 15 percent pebbles throughout. This layer was only visible in the base of the northeast corner of the test unit. No cultural materials were collected from this layer. Due to the presence of the human burial all cultural materials recovered from Layer I were re-interred within TU-1. This test unit was backfilled to protect the burial. No further testing was conducted at this site.

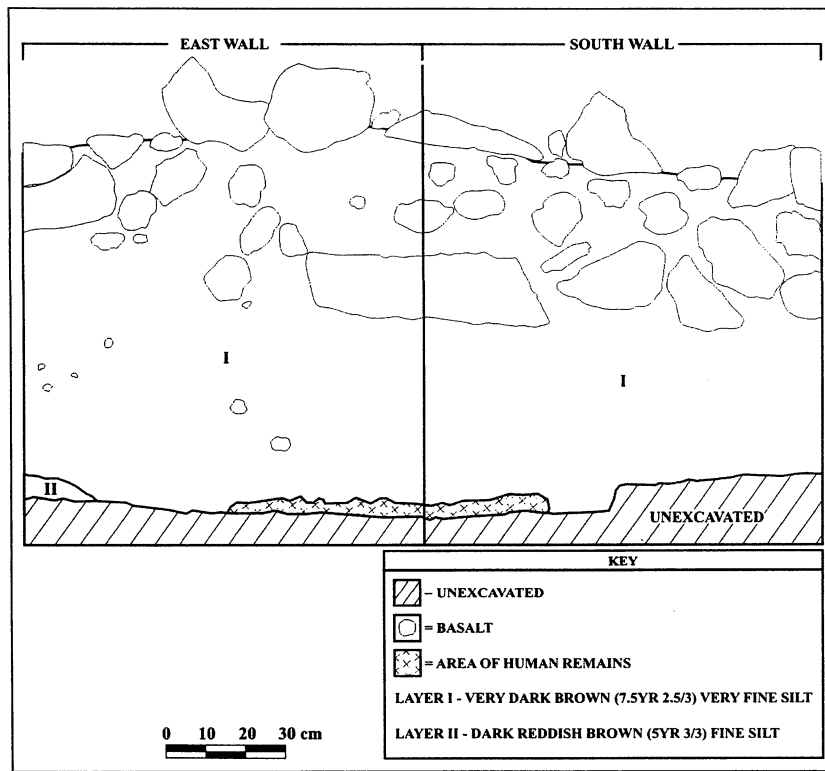


Figure 45: Road F, Feature 1, TU-1 Profile.

ROAD G RESULTS: SOUTH RUN

ROAD G SOUTH RUN SUMMARY

One site with several newly identified features were located along the 'South Run' of Road G (see Figure 3). Site -3269, a multi-component site consisting of habitation and agricultural loci, contained four previously-unrecorded terraces (see Kolb *et al.* 1997:A-218-A-224 for Site -3269 information). These are newly recorded features of Site -3269 and have been assigned the feature designations T-3, T-4, T-5, and T-6.

Site -3269 T-3, T-4, and T-5 are terraces located in the middle of the 'South Run' of Road G. These terraces occupy an area of approximately 200 m² (Figure 46). Vegetation surrounding these features consisted of lantana, wattle, *panini*, grasses, and Christmas berry. No artifacts or midden were observed on the ground surface. No testing was done at these features during the present survey. A single terrace designated as Terrace 6 (T-6) was located in a small swale (Figure 47). Based on geographic positioning, this feature is presently being designated as another terrace associated with Site -3269. This feature is interpreted as a 'check dam', functioning to catch surface water draining within the small swale. No artifacts or midden were observed at the ground surface. No testing was completed at this feature.

SITE -3269 FEATURE DESCRIPTION

Site -3269 T-3 and T-4 consists of a pair of closely-associated terraces in the middle of the 'South Run' of Road G (see Figure 46). As stated above, these previously-unrecorded terraces were located in the area of Site -3269 (Kolb *et al.* 1997:A-224), and are now considered additional features of this site. Site -3269 T-5 was located approximately 10 m southeast of T-3 and T-4, close to the east edge of the road corridor.

These three features were located in a small drainage swale, which would have flowed from southeast to northwest. All three terraces were constructed of cobbles and small boulders. T-3 was approximately 10.5 m long, 0.45–0.67 m high (front face) and 0.50–1.00 m wide. This terrace partially runs along a ridge contour. T-4 was approximately 8.5 m long, 0.50–0.87 m high (front face), and 0.50–1.00 m wide. This terrace partially incorporates small sections of bedrock outcrop. T-5 was approximately 7.5 m long, 0.65 m high (front face), and 0.50–1.00 m wide. These terraces are considered as part of a small agricultural terrace complex. No test units were excavated at these features.

One additional feature, designated Feature T-6, was located in a small drainage (swale) within Road G (see Figure 47). This terrace was oriented perpendicular to the flow of the drainage and parallel to the edges of the road corridor. The terrace was constructed of cobbles

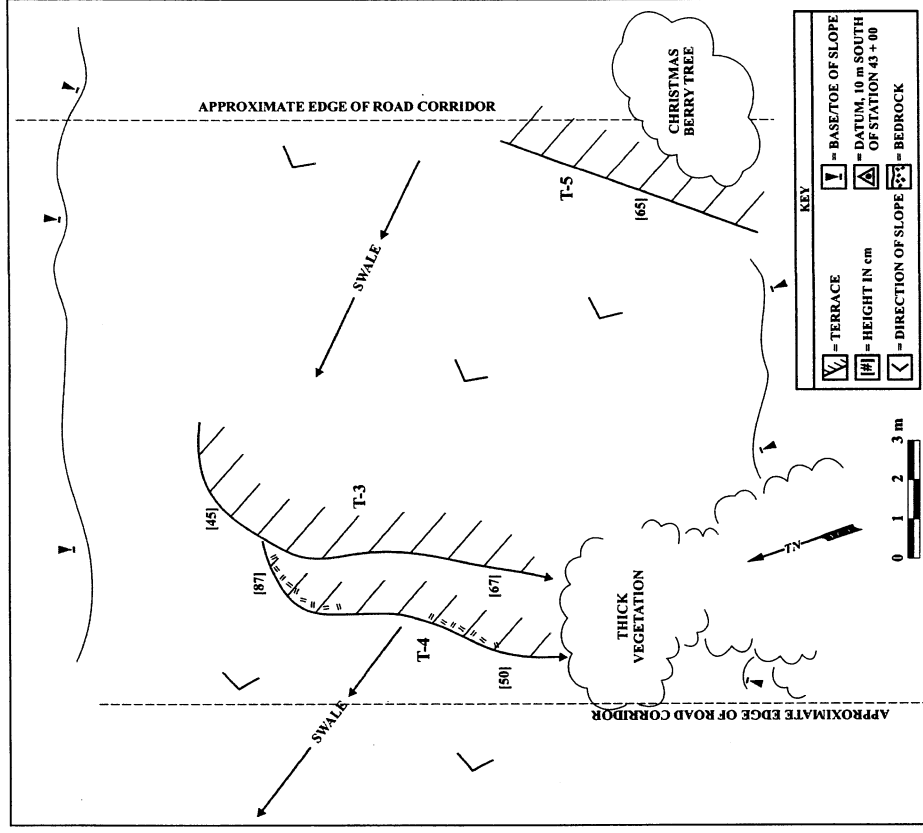


Figure 46: Road G (South Run), Site -3269, Feature T-3, T-4, and T-5 Plan View Map.

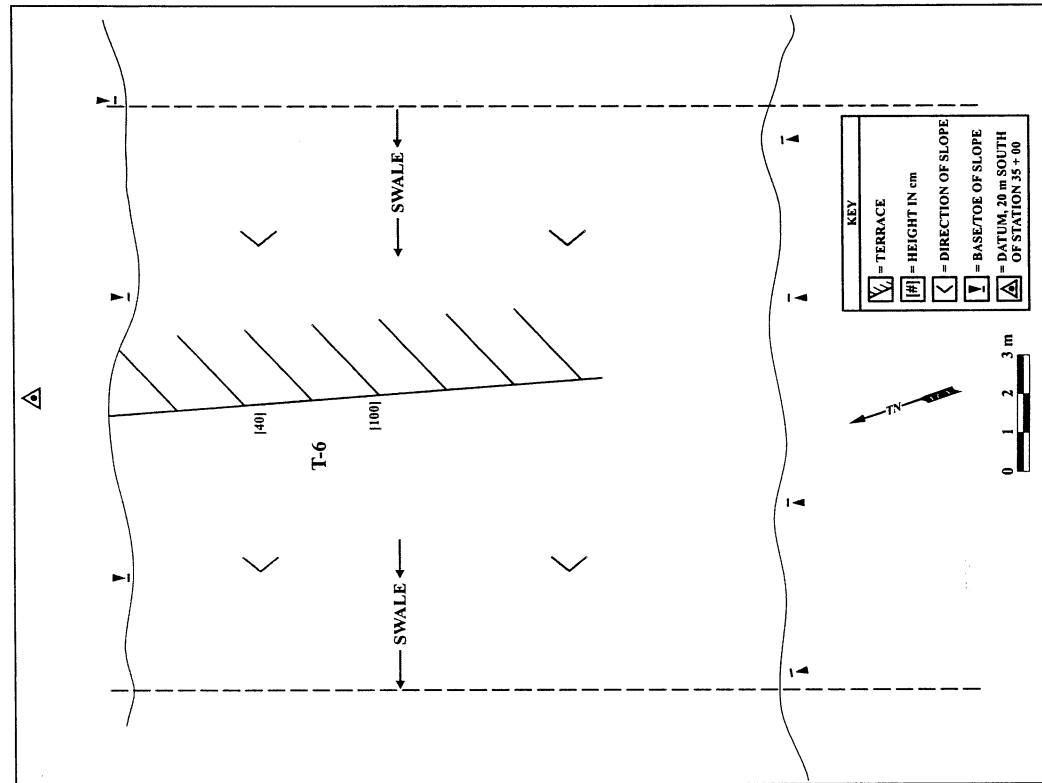


Figure 47: Road G (South Run), Site -3269, Feature T-6 Plan View Map.

and boulders stacked up to 2-3 courses high; it measured approximately 13.0 m long, 0.40-1.00 m high (front face), and 0.40-0.80 m wide. The feature is in fair condition, having been altered somewhat by livestock (cattle) and other natural processes (e.g., weathering, vegetation growth). This terrace is designated as part of Site -3269 and represents a small water control feature (check dam) associated with traditional-period agriculture. No test units were excavated at this feature.

ROAD G NORTH LOOP

ROAD G NORTH LOOP SUMMARY

Three features were located along the 'North Loop' of Road G (see Figure 3). These features were not previously recorded by Kolb *et al.* (1997). These features have been assigned to Site -3257, a site also subject to Data Recovery (Dega *et al.*-in preparation). The three features consist of a wall (boundary) and two terraces (small-scale agriculture).

The two terraces and one wall were recorded in the Road G ('North Loop') corridor.

Feature 1 consists of a section of wall located near the approximate intersection of Road G ('North Loop') and Road G-1/D-1, in a dense thicket of *ilima* and *lantana*. A large *kinawe* tree is located several meters north-northwest of the wall. Feature 2 is a terrace built upon an outcrop on a steep (40°-45°) slope. Feature 3 is a terrace constructed upon an outcrop on a steep (40°-45°) slope and is located approximately 12.0 m southeast of Road G Station 16+00. No artifacts or midden were observed on the ground surface at these features. No testing was conducted at these features. The fairly isolated features are suggestively traditional in origin, although no testing was accomplished. They appear down-slope from remnant features associated with Site -3257.

SITE 'ROAD G (NORTH LOOP)' FEATURE DESCRIPTION

The wall designated Feature 1 was located at the base (toe) of a slope. Feature 1 was constructed of dry-stacked cobbles and boulders, 3-5 courses high, with partial facing on portions of its north side (Figure 48). The wall was oriented roughly east-to-west and measured approximately 20.0 m (length) by 0.80-1.20 m (width) by 0.67-0.86 m (north side height); maximum height on the south (upslope) side ranged from 0.10-0.53 m above the ground surface. The wall was completely collapsed (tumbled) at its west end while several other areas of collapse were located along its north side. A cattle trail breached the wall. Portions of the feature were in good shape, although most was in poor-fair physical condition. Feature 1 has clearly been altered by cattle, and perhaps by wild deer as well. The wall was interpreted as a boundary wall segment. The temporal affiliation of the wall is unknown.

The terrace designated Feature 2 was located roughly halfway up a steep (40°–45°) slope. Feature 2 was constructed of dry-stacked cobbles and boulders, 1–2 courses high, directly atop a bedrock outcrop (Figure 49). The outcrop and terrace are oriented roughly northeast-to-southwest. The terrace measured approximately 7.0 m (length) by 0.20–0.40 m (width) by 0.52–0.80 m (maximum height). The terrace was in poor physical condition, having been altered by cattle. In fact, the entire slope at and around this feature had been significantly altered by cattle trails and tracks. The terrace was interpreted as affiliated with traditional-period agriculture.

The terrace designated Feature 3 was located at the base (toe) of a slope. Feature 3 was constructed of dry-stacked cobbles and boulders, 1–2 courses high, directly atop a bedrock outcrop (Figure 50). The outcrop and terrace are oriented roughly northeast-to-southwest. The terrace measured approximately 12.0 m (length) by 0.50–1.00 m (width) by 0.62–0.77 m (maximum height). The terrace was in fair to poor physical condition, having been altered by cattle. Like Feature 2, the entire slope at and around this feature had been significantly altered by cattle trails and tracks. Feature 3 was also interpreted as an agricultural feature associated with small-scale, traditional-period agriculture.

ROAD H RESULTS

ROAD H SUMMARY

Portions of four sites were located along the Road H corridor (see Figure 3). All four sites were previously identified by (Kolb *et al.* 1997) but four features within two of these sites were not previously recorded. The four previously recorded sites consist of Site -3268, -3272, -3274, and -3280. Newly identified Features 1 and 4 are associated with Site -3280 while Features 2 and 3 are affiliated with Site -3268.

The four previously identified features consist of the following: Site -3268 W-1 is a wall that crossed Road H (Kolb *et al.* 1997:A-218). Site -3268 P-1 is a platform located within the road; this feature was excavated during Inventory Survey (Kolb *et al.*:B-301). Site -3272 W-2 is a wall built on an outcrop that crossed Road H (Kolb *et al.* 1997:A-231). The outcrop and wall are perpendicular to the road. Site -3274 WT-1 is a walled-terrace/enclosure located along the southern extent of Road H (Kolb *et al.* 1997:A-241-242). Site -3280 GE-5 consists of two sections of wall that cross Road H (Kolb *et al.* 1997:A-261). Both of these walls continued to the east and the west of the road, and were part of a larger structure interpreted as a 'garden enclosure' by Kolb *et al.* (1997:A-261).

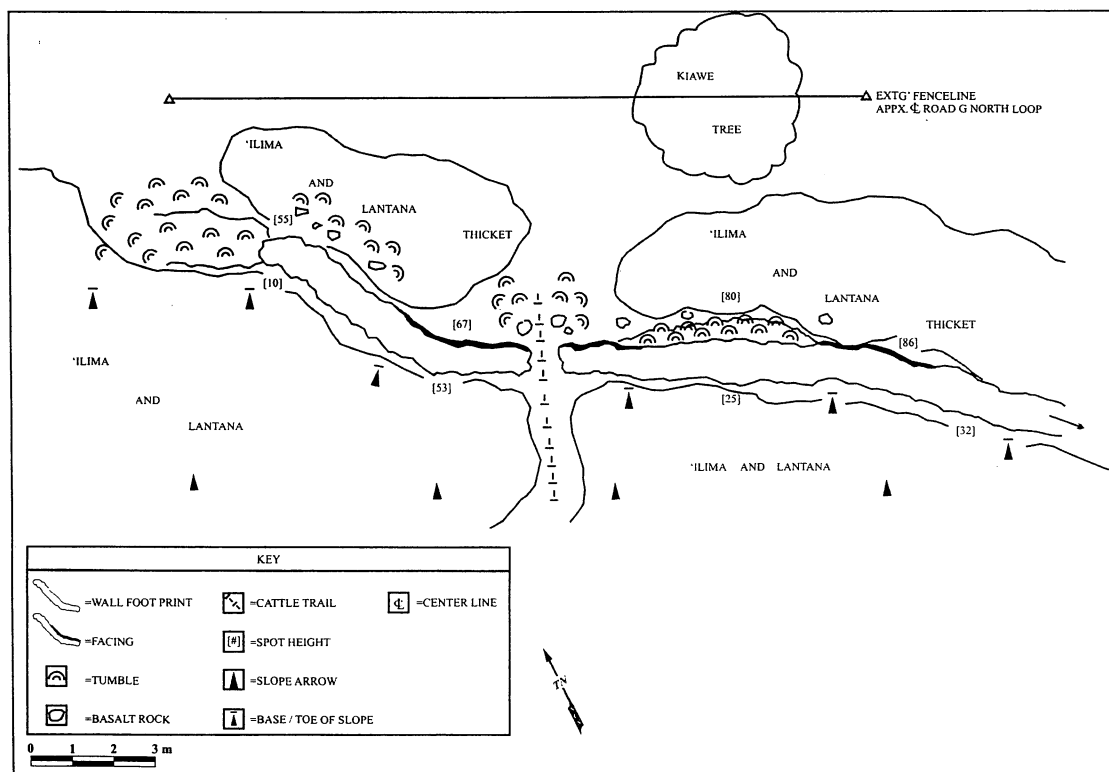


Figure 48: Road G (North Loop), Site -3257, Feature 1 Plan View Map.

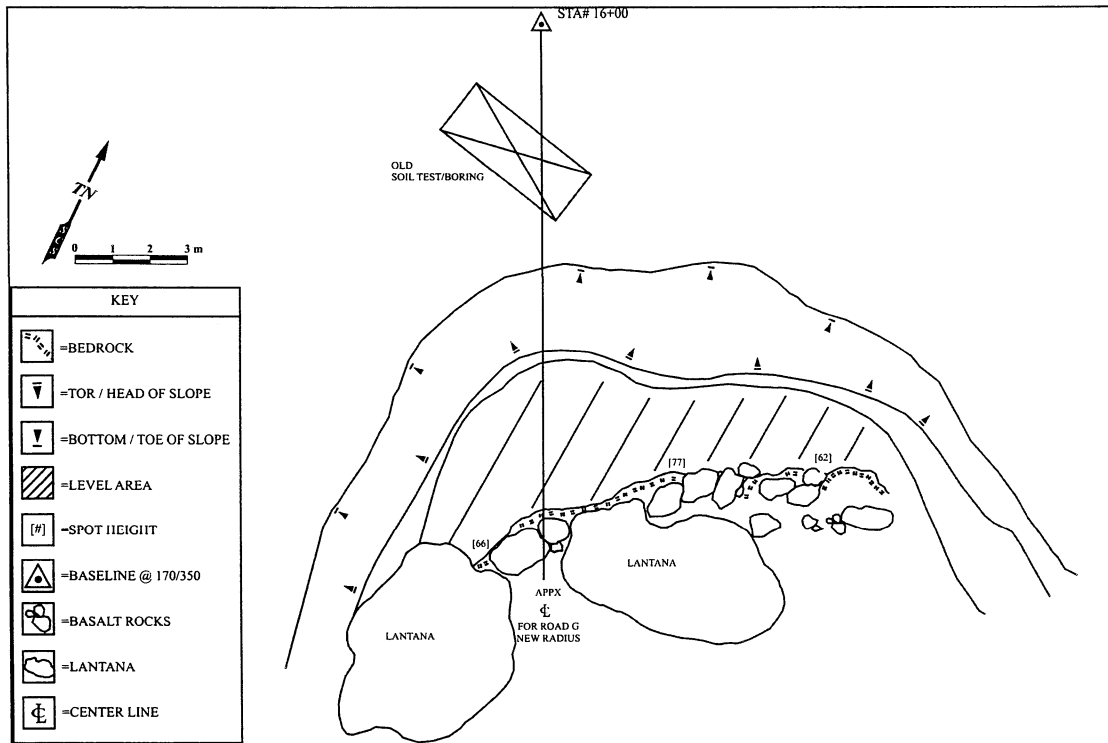


Figure 50: Road G (North Loop), Site -3257, Feature 3 Plan View Map.

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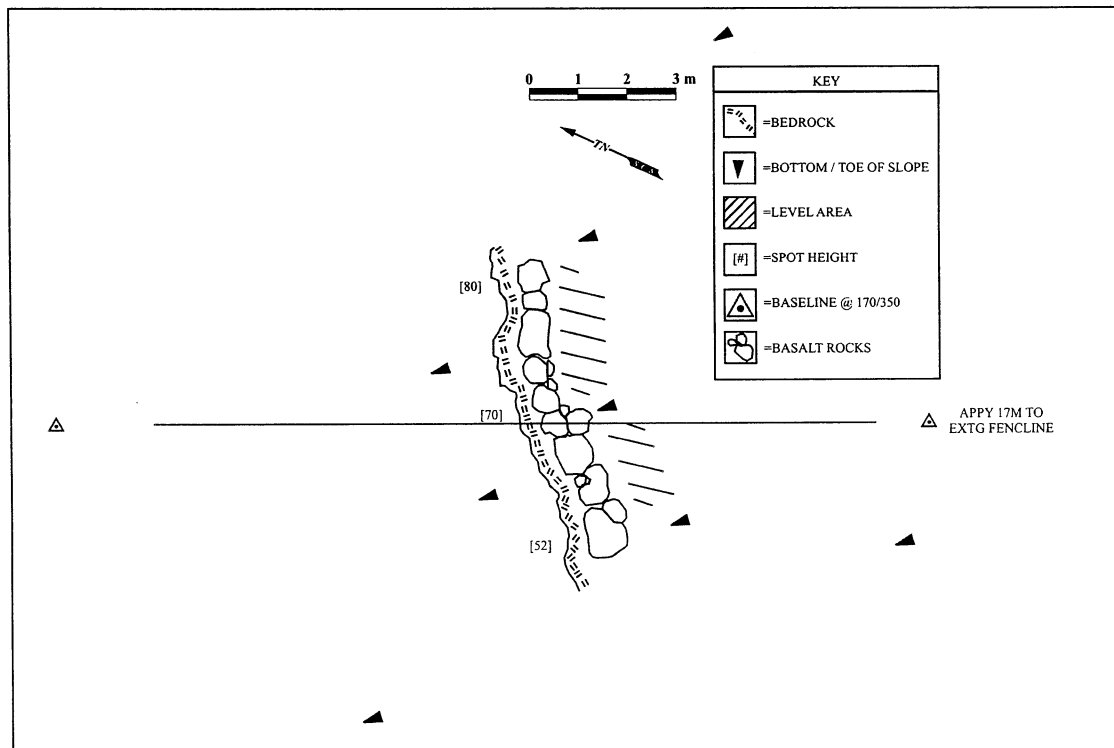


Figure 49: Road G (North Loop), Site -3257, Feature 2 Plan View Map.

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The four newly identified features, designated Features 1–4 during the present survey, were located across or within Road H. These features are associated with Sites -3268 and -3280 respectively. The features consisted of two walls, one remnant enclosure, and one platform/terrace. With the exception of one traditional basalt core observed at Feature 2, no artifacts or midden were observed on the ground surface of these features. No testing was done at these four traditional-period habitation and agricultural features.

SITE -3268 FEATURE DESCRIPTIONS

Feature W-1 is an irregularly-shaped wall that crosses Road H (Kolb *et al.* 1997:A-218), and continues in a southern direction down the road corridor (Figure 51). The section that crosses Road H was oriented roughly east-west and was located approximately 15 m south of Feature 1, Road H Site. Both ends of the Feature W-1 wall continue outside the road corridor to the east and to the west. Halfway across this section of wall (in the middle of the road corridor), Feature W-1 continued south within the road corridor over a distance of approximately 75 m before exiting the road corridor to the east. At several places along its length, the wall was partially truncated by collapse and by a small gully near the south end of the feature. The wall varied from good to fair physical condition and had clearly been altered by livestock (cattle). The wall was constructed of cobbles and small boulders which were stacked 2–3 courses high. Wall thickness ranged from 1.00–1.20 m; maximum wall height ranged from 0.60–0.90 m above the surface. No test units were excavated at this feature. The wall is interpreted to be a remnant enclosure wall (garden enclosure) or boundary wall.

Feature P-1 is a platform located within the road (Kolb *et al.* 1997:A-218) approximately 20 m south of the northern end of Feature W-1 (Site -3268). The oval-shaped platform was constructed of small and medium cobbles 2–3 courses high (Figure 52). The feature was in poor to fair condition, with portions of it have collapsed. Maximum dimensions of the platform are approximately 4.0 m long by 3.0 m wide (12 m²) by 0.40 m high. Feature W-1 (Site -3268) abuts the northwest and southwest sides of the platform. This prehistoric habitation feature was tested during original Inventory Survey (Kolb *et al.* 1997:B-301) and only yielded small amounts of charcoal.

SITE -3272 FEATURE DESCRIPTION

Feature W-2 is a wall built on an outcrop that crosses Road H (Kolb *et al.* 1997:A-231). The outcrop and wall are perpendicular to the road and continue on both sides to the east and west. The wall was constructed of cobbles and small boulders and is discontinuously expressed across the top of the outcrop (Figures 53 and 54). The ground drops 3.0 to 3.5 m on the south side of the modified outcrop/wall. Feature 4 (Site 'Road H') abuts the east end of this outcrop

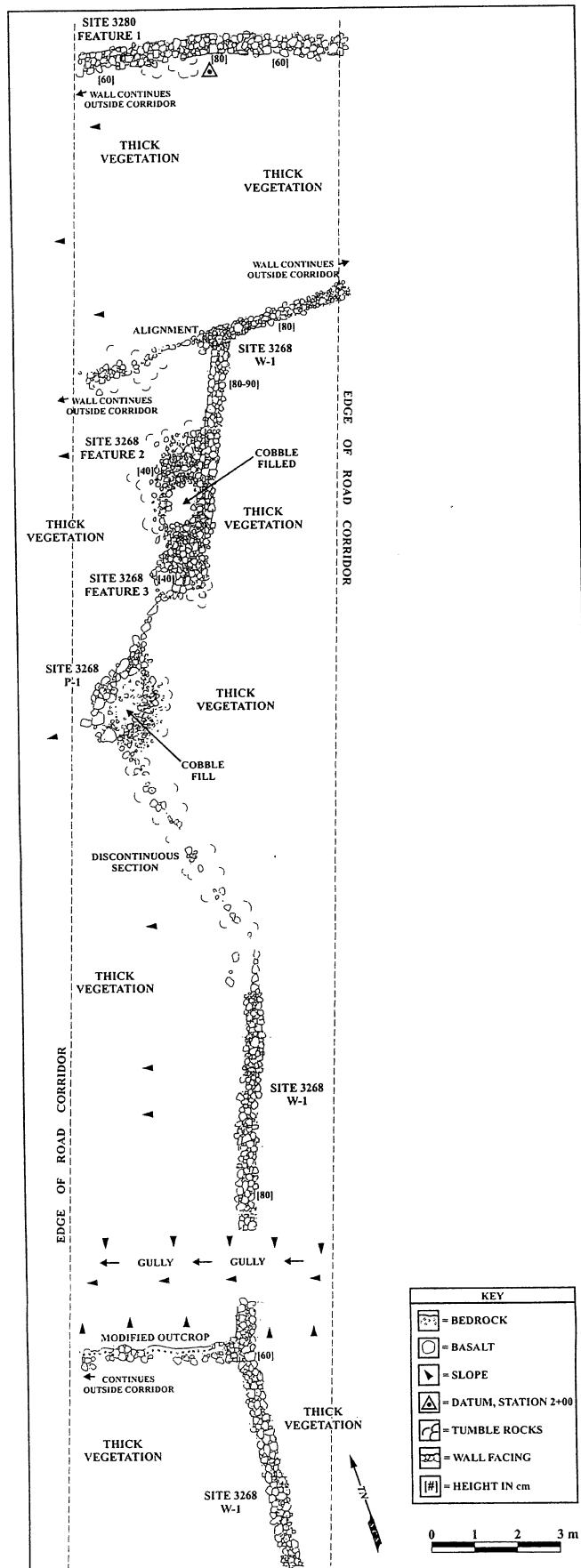


Figure 51: Road H, Site -3268, Features 2, 3, W-1, P-1. Also Pictured: Site -3280, Feature 1 Plan View Map.

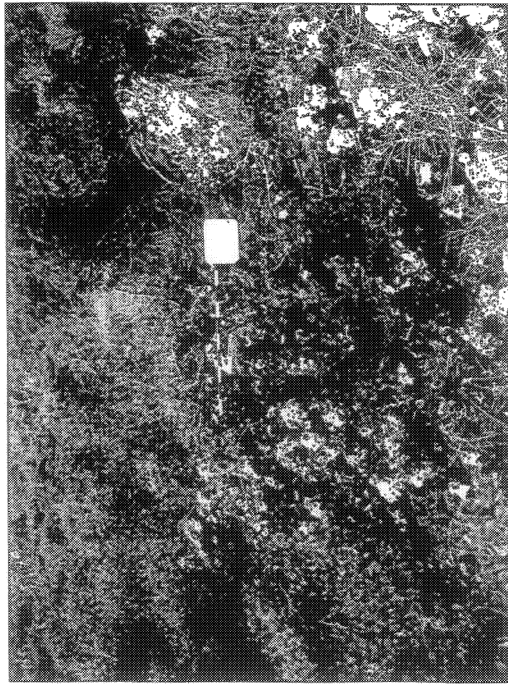


Figure 52: Road H, Site -3268, Feature P-1, View to South.

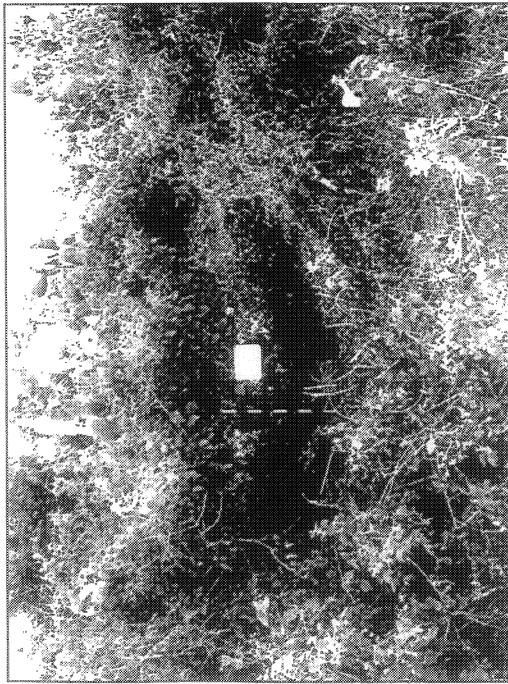


Figure 53: Road H, Site -3272, Feature W-2 Overview. View to North.

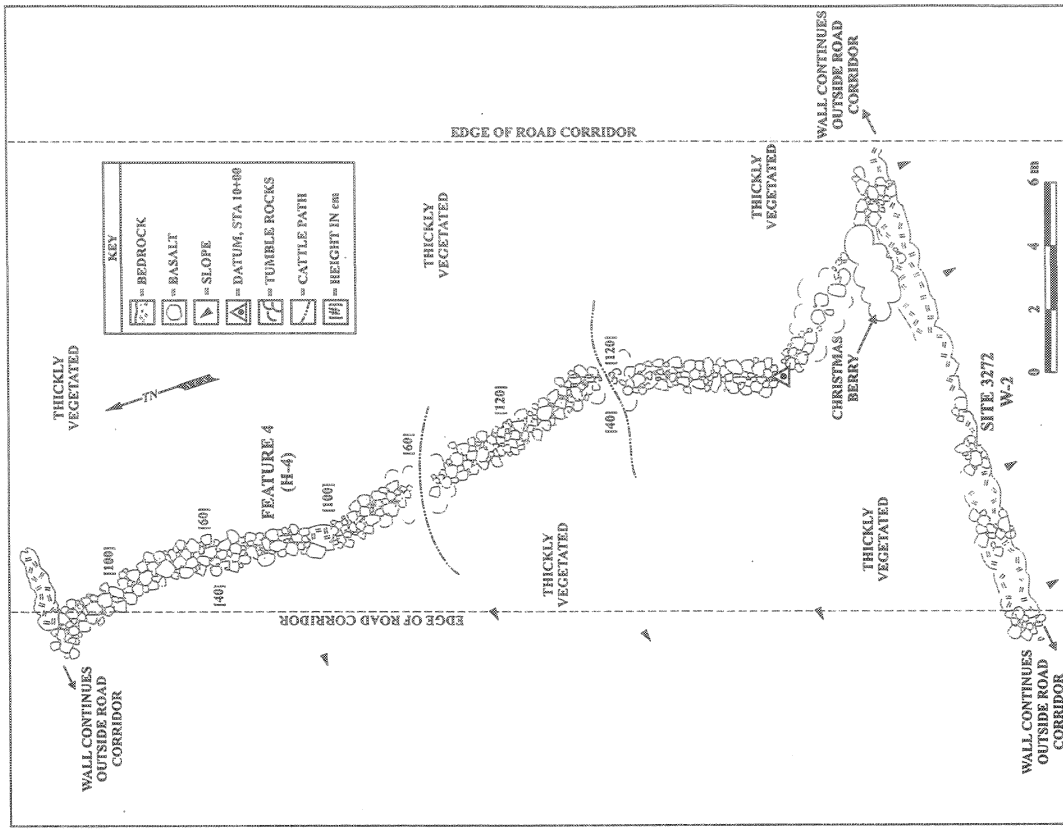


Figure 54: Road H, Site -3272, Feature W-2 Plan View Map.

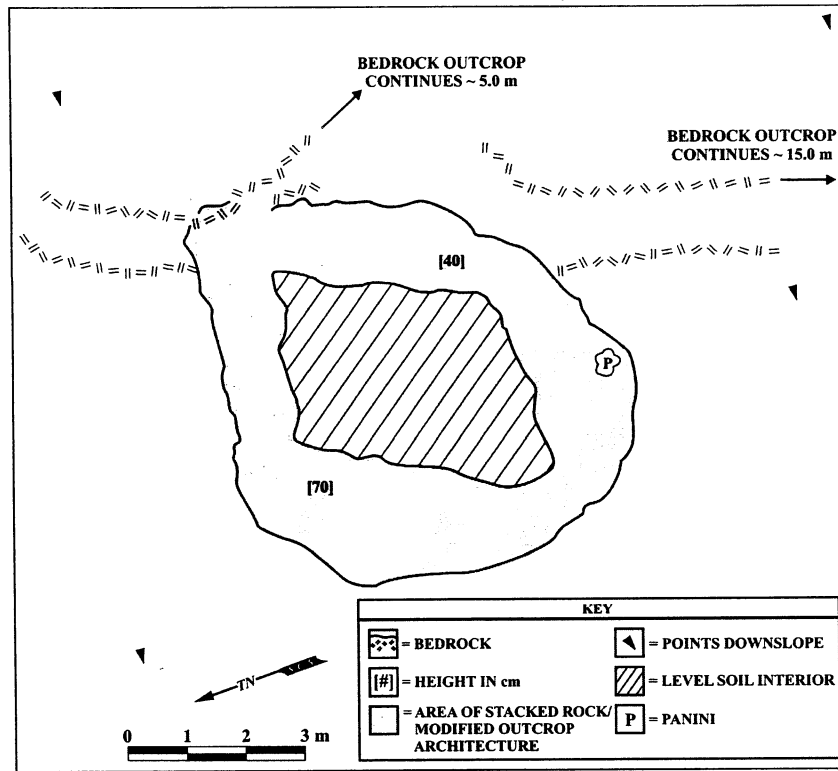


Figure 55: Road H, Site -3274, Feature WT-1 Plan View Map.

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feature. No test units were excavated at this feature. Feature W-2 was interpreted by Kolb *et al.* (1997:A-231) as a boundary wall.

SITE -3274 FEATURE DESCRIPTION

Feature WT-1 is a walled-terrace/enclosure located in the center of Road H along the road's southern extent (Kolb *et al.* 1997:A-241-242). The feature was located on a gentle slope in an open pasture. The feature utilized a modified bedrock outcrop to form its east wall (Figure 55). The north, west, and east walls were constructed of 2-4 courses of medium-large cobbles and small boulders. These walls define a level soil interior. Maximum exterior dimensions were approximately 7.0 m by 6.0 m (42 m²), with wall thickness ranging from 1.0-2.0 m. The level soil interior measured approximately 4.0 m by 3.0 m (12 m²). The feature exists in fair condition only, having been altered by livestock (cattle) and other natural processes (*e.g.*, weathering, vegetation growth). This feature was tested during Inventory Survey (Kolb *et al.* 1997:B-329-332) and yielded a hearth, post mold, charcoal, and sea urchin. No test units were excavated at this feature during the present survey. Feature W-1 is interpreted as a traditional-period habitation structure.

SITE -3280 FEATURE DESCRIPTION

Site -3280 GE-5 has two sections of wall that cross Road H (Kolb *et al.* 1997:A-261). Both sections of wall continue to the east and west of the road and were part of a larger garden enclosure, as interpreted by Kolb *et al.* (1997:A-261). A majority of this large enclosure occurs outside the road corridor. The sections of wall are oriented roughly on an east-west axis, across the road, and each section is 15-16 m long between the east and west edges of the road corridor (Figure 56). The walls were constructed of cobbles and small boulders. The northern wall was stacked 2-3 courses high; the south wall was stacked 3-5 courses high. Wall thickness ranged from 0.60-1.00 m. Maximum height above ground surface ranged from 0.20/0.35 m to 0.90/1.10 m. No test units were excavated at this large agricultural feature during either phase of research.

SITE 'ROAD H' NEW FEATURE DESCRIPTIONS

Four additional features, designated 'Road H' Features 1-4, were located across or within the Road H corridor. These features are associated with the two previously-identified sites described above: Features 1 and 4 are associated with Site -3280 and Features 2 and 3 are affiliated with Site -3268. No test units were excavated at these four features.

Feature 1 consists of an informally-constructed wall that crosses the road corridor and continues in a roughly east-west orientation (see Figure 51). The wall was constructed of

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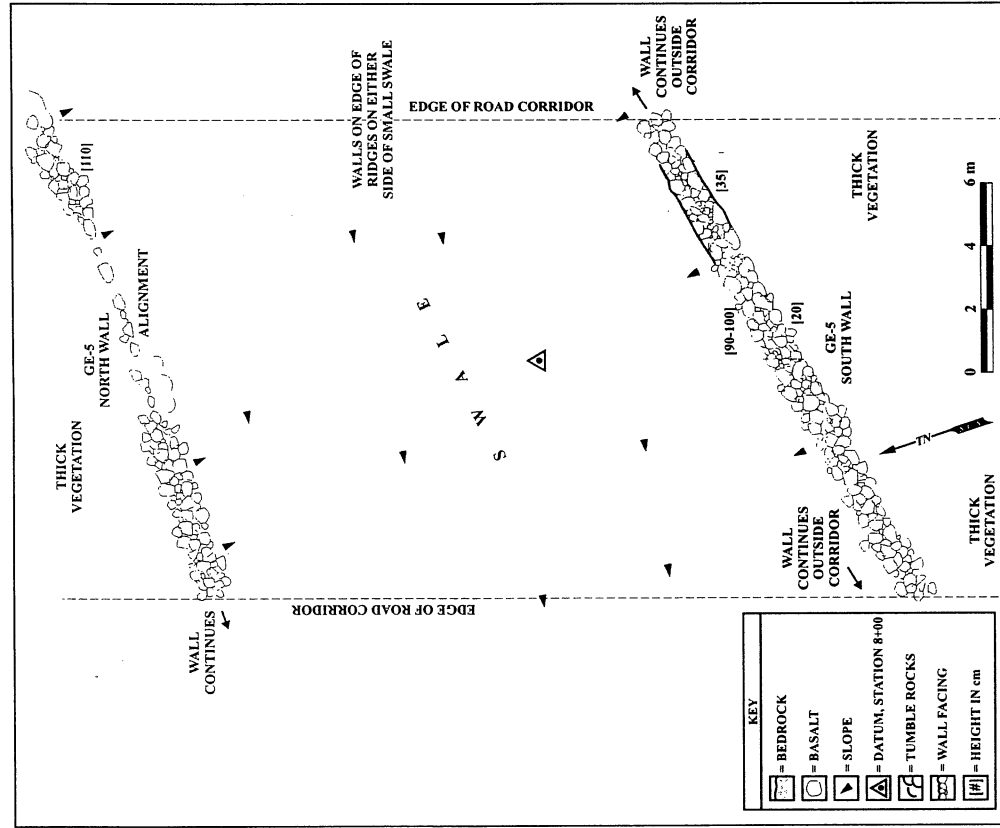


Figure 56: Road H, Site -3280, Feature E-5 Plan View Map.

boulders stacked 2–3 courses high. The wall was 0.60–0.80 m high and approximately 1.0 m wide. The feature was in good condition, although it had been altered somewhat by livestock (cattle) and other natural processes (e.g., weathering, vegetation growth). Feature 1 is interpreted as a boundary or agricultural wall associated with prehistoric times. This feature is associated with Site -3280.

Feature 2 is a collapsed/degraded platform or terrace abutting the west side of a portion of Feature W-1, Site -3268 (see Figure 51). The feature was constructed of small to medium cobbles. Maximum dimensions of the structure were approximately 7.5 m long by 3.0 m (22.5 m²). Maximum height above ground surface was measured at 0.40 m. One basalt core was located on the ground surface of the feature. The core was collected and is currently being curated by SCS. The feature was in poor condition, having been altered by livestock (cattle) and other natural processes (e.g., weathering, vegetation growth). This feature is presumed to represent a small habitation platform/terrace and is subsumed under Site -3268.

Feature 3 is a small, informally-constructed enclosure abutting the west side of a portion of Feature W-1 (Site -3268), immediately south of Feature 2 (Figure 57). The enclosure was constructed primarily of medium-sized cobbles and small boulders. Maximum exterior dimensions of this enclosure measure approximately 3.0 m by 2.5 m (7.5 m²); maximum interior dimensions were approximately 1.4 m by 1.2 m (1.7 m²). Maximum height above ground surface is 0.40 m. The feature was in poor condition, having been altered by livestock (cattle) and other natural processes (e.g., weathering, vegetation growth). Feature 3 was interpreted in the field as a structure ancillary to Feature W-1, Site -3268, the latter being an agricultural locus. Feature 3 is directly affiliated with Site -3268.

Feature 4 is an irregularly-shaped wall running through the middle of the Road H corridor, in a roughly north-south orientation (see Figure 53). The wall is straight in short sections, with several slight changes in orientation, giving it an overall sinuous shape in plan view. The maximum length of the wall, as it occurs within the road corridor, is approximately 31.0 m. The wall continues outside the road corridor to the north-northwest and to the east-southeast. The wall was constructed of cobbles and small boulders, with a maximum height ranging from 0.40 m (east wall face) to 0.60–1.20 m (west wall face). Wall thickness ranges from 0.90–1.50 m. The feature was generally in good condition, although it had been altered somewhat by livestock (cattle) and other natural processes (e.g., weathering, vegetation growth). In particular, the wall was breached in two places by cattle paths. Feature 4 is associated with Site -3280 and occurs near GE-5.

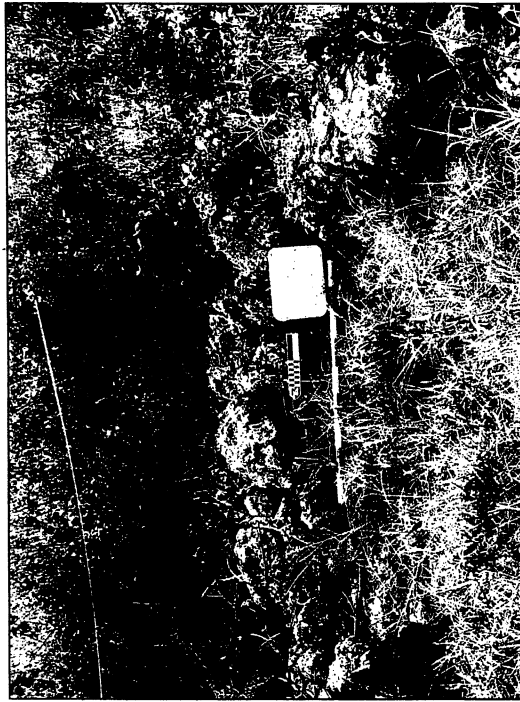


Figure 57: Road H, Feature 3, View to East.

ROAD I RESULTS

ROAD I SUMMARY

During this road corridor survey, a set of agricultural terraces was documented along the southern flank of Road I near the Keokea parcel (see Figure 3). These terraces were directly associated with Site -3222, a site consisting of a set of four previously identified terraces that were documented during Inventory Survey (Kolb *et al.* 1997:A-98-100). During the present survey, six new terraces were mapped and recorded, bringing the total number of terraces associated with Site -3222 to a complex of ten terraces. All the features occurred on the slope of a ridge over a small swale and form angular sections of a prehistoric agricultural complex. No testing has been conducted at this site. Additionally, Road I also contained two habitation enclosures associated with Site -3223 (Features E-2 and E-3) that would be impacted by road construction. These two enclosures were documented and tested during Data Recovery work (Dega *et al.*-in preparation).

ROAD I FEATURE DESCRIPTIONS

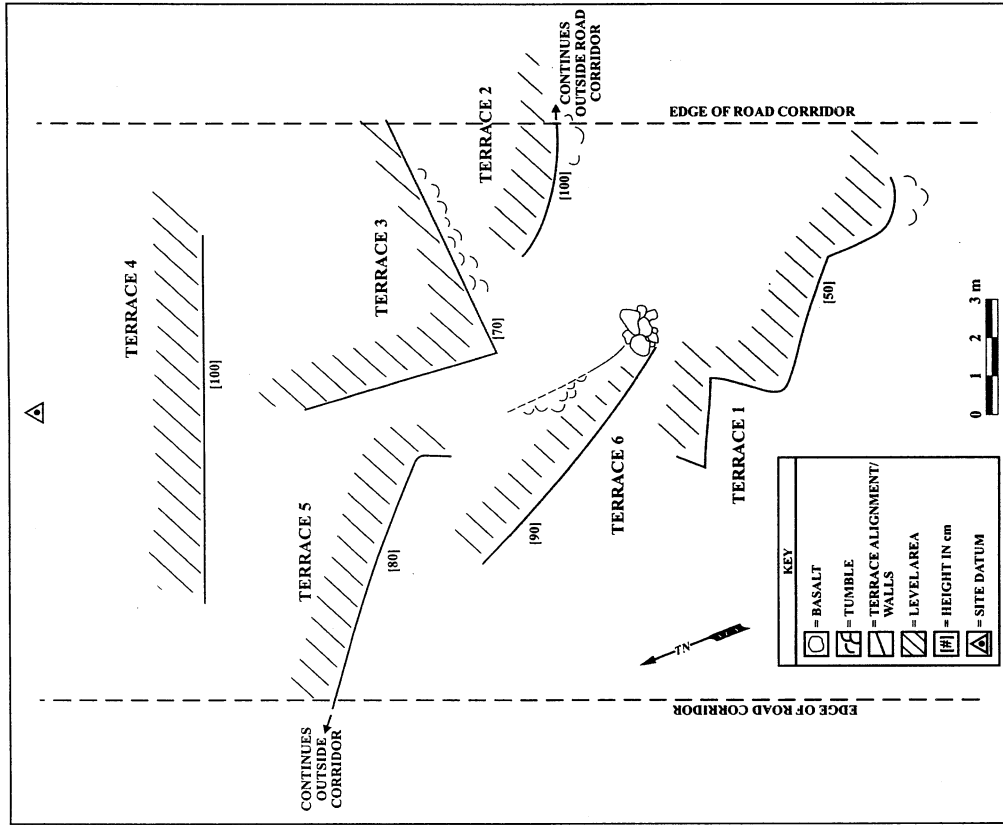
Terrace 1 measures 10+ m long by a variable 0.30-1.0 m wide and was constructed of 1-3 courses of medium to large stacked cobbles and boulders (Figure 58). Primarily oriented on an east-west axis, the terrace does angle to the north and south along its principal east-west direction. The terrace measures c. 0.50 m above the ground surface and has moderate integrity, some wall tumble occurring along the down slope (south) side of the feature. No cultural materials were identified in association of this feature, this not surprising considering the agricultural nature of the terrace. Terrace 1 functioned in concert with nine other terraces to form a prehistoric agricultural complex. This feature was not tested.

Terrace 2 measures 4 m long by a variable 0.50-0.80 m wide and was constructed of 3-5 courses of medium cobbles and boulders. The terrace is longer than 4.0 m (to approximately 10+ m) yet only the 4 m reported on herein occur in the Road I corridor (see Figure 58). Terrace 2 is also oriented on an east-west axis and measures c. 1.00 m above the ground surface. The feature has moderate-good integrity, with the northern flank being well preserved with some wall tumble occurring along the southern side of the feature. No cultural materials were identified in association of this feature. Terrace 2 was one terrace in the larger prehistoric agricultural complex. This feature was not tested.

Terrace 3 is L-shaped and extends for 7+ m on an east-west axis and another 5.5 m on a north-south axis (see Figure 58). The terrace is 0.80 m wide and was constructed of 1-2 courses of large stacked cobbles and boulders. The terrace measures c. 0.70 m above the ground surface and has moderate integrity. No cultural materials were identified in association of this feature and it was not tested. Terrace 3 is part of a larger prehistoric agricultural complex.

Terrace 4 measures c. 10+ m long by a variable 0.60-0.80 m wide and was constructed of 1-2 courses of large cobbles and boulders. Primarily oriented on a southeast-northwest axis, the terrace runs perpendicular through the road corridor (see Figure 58). The terrace measures c. 1.00 m above the ground surface and also has fair-good integrity. No cultural materials were identified in association of this feature and it was not subject to excavation. Terrace 4 functioned to form a portion of the Site -3222 prehistoric agricultural complex.

Terrace 5 was documented in the western half of the Road I corridor, perpendicular to the road (see Figure 58). The terrace remnant measures 7+ m long and was constructed of 1-2 courses of medium to large stacked cobbles fill and boulders. The terrace does extend beyond the boundaries of the road corridor for an unknown length. The terrace measures c. 0.80 m above the ground surface and has fair-good feature integrity. No cultural materials were



identified in association of this feature and it was not subject to excavation. Terrace 5 represents a portion of the Site -3222 prehistoric agricultural complex.

Terrace 6 measures 7.5 m long and was constructed of 4-5 courses of large cobbles and boulders. The terrace terminates in a rock mound measuring 1.5 m in diameter and composed of large cobbles. Primarily oriented on a northwest-southeast axis, the terrace averages c. 0.90 m above the ground surface and has poor-fair integrity with much wall tumble (see Figure 58). No cultural materials were identified in association of this feature and it was not tested. Terrace 6 functioned in concert with nine other terraces to form a prehistoric agricultural complex. The intersecting mound was interpreted in the field as a small mound possibly associated with clearing or sweet potato cultivation.

ROAD J RESULTS

ROAD J SUMMARY

Two sites were documented along Road J (see Figure 3). Site -3246 was previously identified and recorded by Kolb *et al.* (1997:A-161). Road J, Feature 1 was newly discovered at the intersection of Roads A and J during the present survey. Feature 1 is an enclosure. Vegetation along Road J consisted of patches of lantana, wattle, and *Yima*.

Site -3246 P1 is a rectangular platform (Kolb *et al.* 1997:A-161). This site was only relocated, having been mapped and documented previously. This feature was not tested during the original Inventory Survey. Assessed as a permanent habitation structure, two test units were placed within the platform during the current survey. Excavation recovered quantities of traditional artifacts (volcanic glass and basalt debitage), vertebrate remains, and charcoal (see below). The recovered cultural materials, though not present in large quantities, is in agreement with this platform as a habitation site.

Road J Feature 1 is an oval enclosure that was previously unrecorded during original Inventory Survey. This feature is associated with Site -3256. The enclosure was mapped and a single test unit was placed within the enclosure during this phase of research. Excavation recovered the presence of traditional artifacts, marine shell, and charcoal. A few charcoal concentrations were identified within the cultural layer as well. The presence of these concentrations and cultural materials suggest this site was associated with traditional habitation.

SITE -3246 P1 FEATURE DESCRIPTION

Feature P-1 is a slightly disturbed rectangular platform (Figure 59). The feature measures 6.0 m by 4.5 m (27 m²) with the platform height ranging from 0-0.55 m above the surface. The

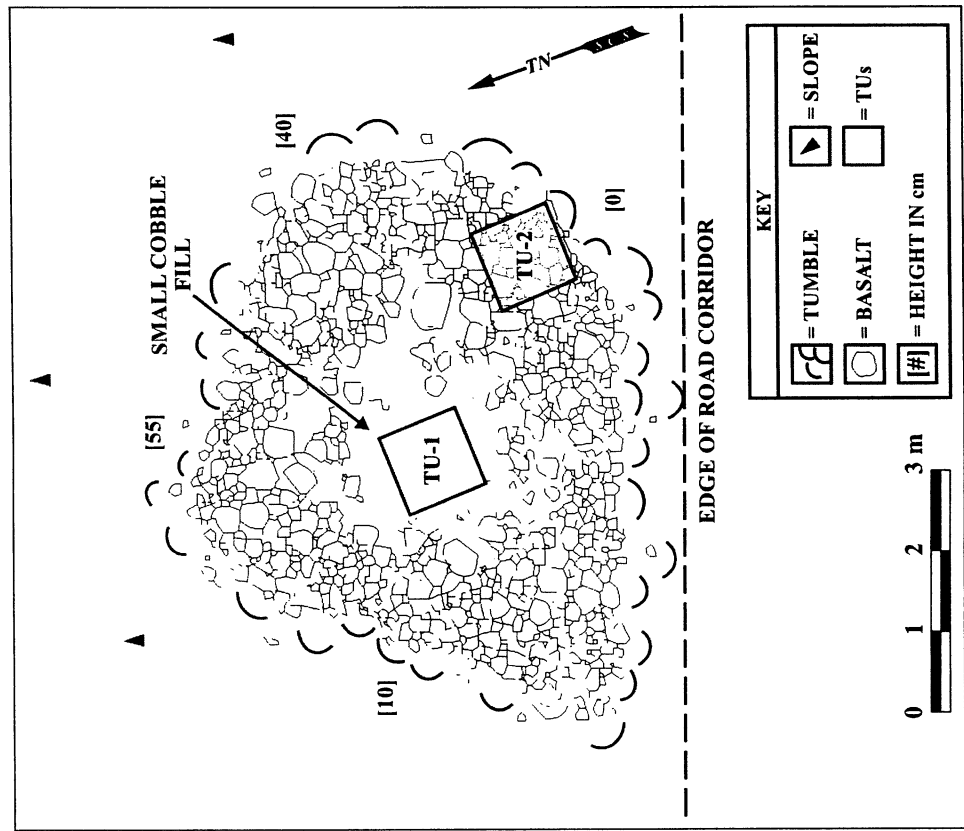


Figure 59: Road J, Site -3246, Feature P-1 Plan View Map.

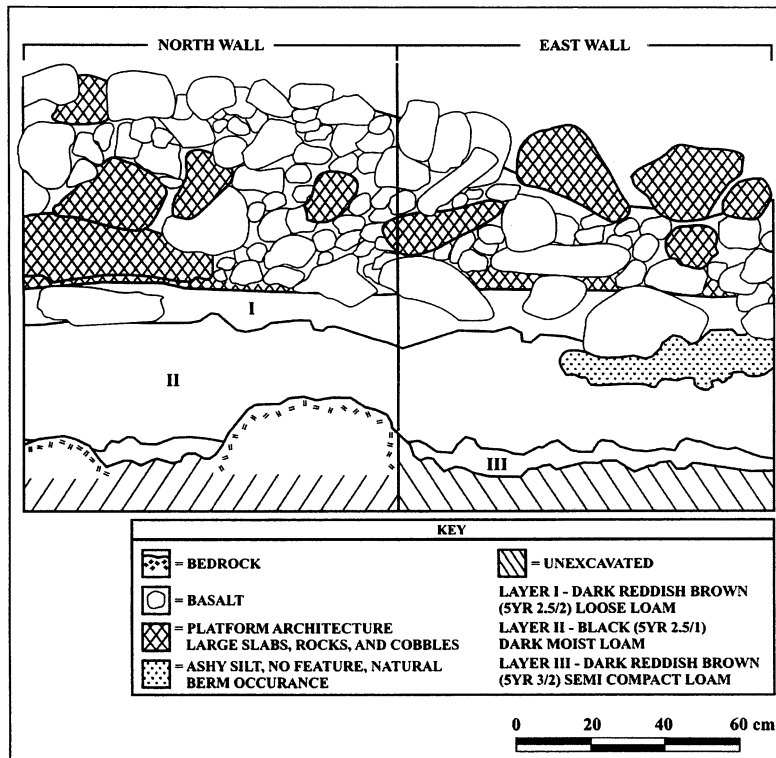


Figure 61: Road J, Site -3246, Feature P-1, TU-2 Profile.

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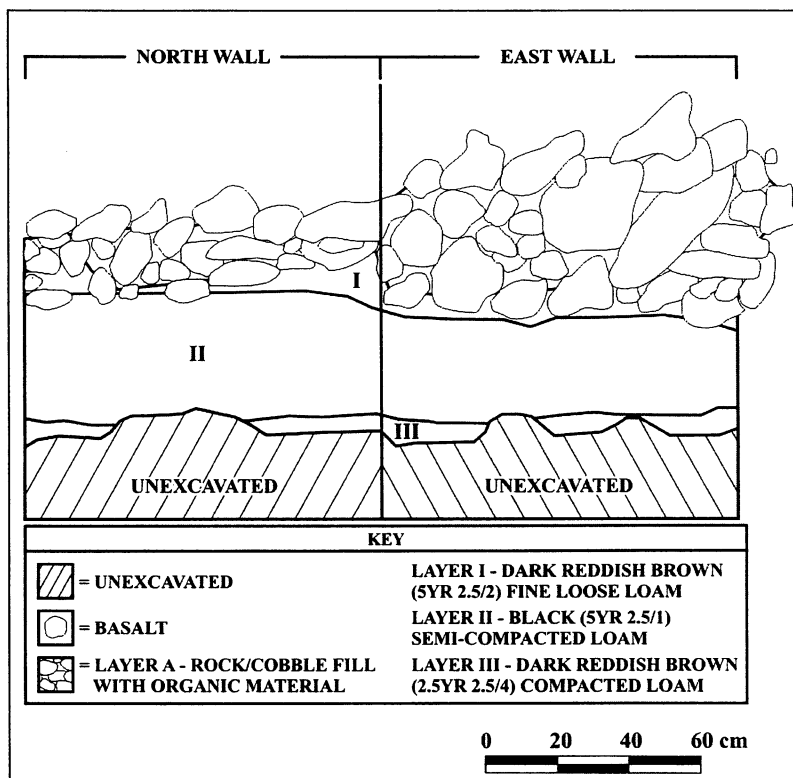


Figure 60: Road J, Site -3246, Feature P-1, TU-1 Profile.

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brown (5YR 3/2) compact silt loam that terminated on the natural bedrock. No cultural materials were observed in this layer. The excavation of TU-2 demonstrated that platform architecture extends into Layer I and, in areas, to the surface of Layer II.

Artifacts

Basalt debitage was collected from Layer II in both units. The majority was found in the centrally located TU-1, with few pieces found in TU-2. A piece of volcanic glass was also recovered from Layer II in TU-2.

Charcoal

Charcoal was recovered from Layer I (12.9 g) in TU-2. Trace amounts of charcoal were observed in TU-1 Layer I, but not collected. Charcoal was also recovered from Layer II of both units. TU-1 produced 46.7 g of charcoal in Layer II, while TU-2 yielded 8.5 g.

Vertebrates

Canis familiaris and *Rattus/Mus* sp. remains were recovered from TU-1 within Layer II.

ROAD J, FEATURE 1 DESCRIPTION

Feature 1, associated with Site -3256, is a slightly oval-shaped enclosure located at the top of a small ridge (Figure 62). The feature measures 6.0 m by 5.0 m (30 m²) with an interior dimension of 3.0 m by 2.5 m (7.5 m²). A 0.50 m wide opening is located within the western wall. The enclosure walls are 2-3 courses high (1.0-2.0 m wide) and constructed of cobbles and small boulders attain a maximum height of 0.44-0.53 m above the ground surface. Portions of the interior and exterior walls are faced. The western wall is slightly tumbled due to vegetative (lantana, *panini* cactus) and animal disturbance. One test unit (TU-1) was excavated in Feature 1 during the current investigations.

ROAD J FEATURE 1 EXCAVATION

Test Unit 1 (TU-1)

One test unit (TU-1), measuring 1.0 m by 2.0 m, was excavated in Feature 1. The test unit's long axis was placed along the southern interior wall of the enclosure, occupying the southwestern half of the interior. Excavation followed natural stratigraphy and exposed three layers (Figure 63). Layer I (0-0.08 mbs) was composed of very dark gray (5YR 3/1) silt loam with many medium to fine roots throughout. Pebbles and cobbles comprised 15 percent of the matrix. A few pieces of volcanic glass and basalt debitage were collected in this layer. A modern piece of tin was also observed, but not collected. Layer II (0.06-0.24 mbs) was composed of very dark gray (5YR 3/1) to black (5YR 2.5/1) silt loam. Small cobbles and pebbles comprised 35 percent of the matrix. Traditional artifacts (basalt debitage and volcanic

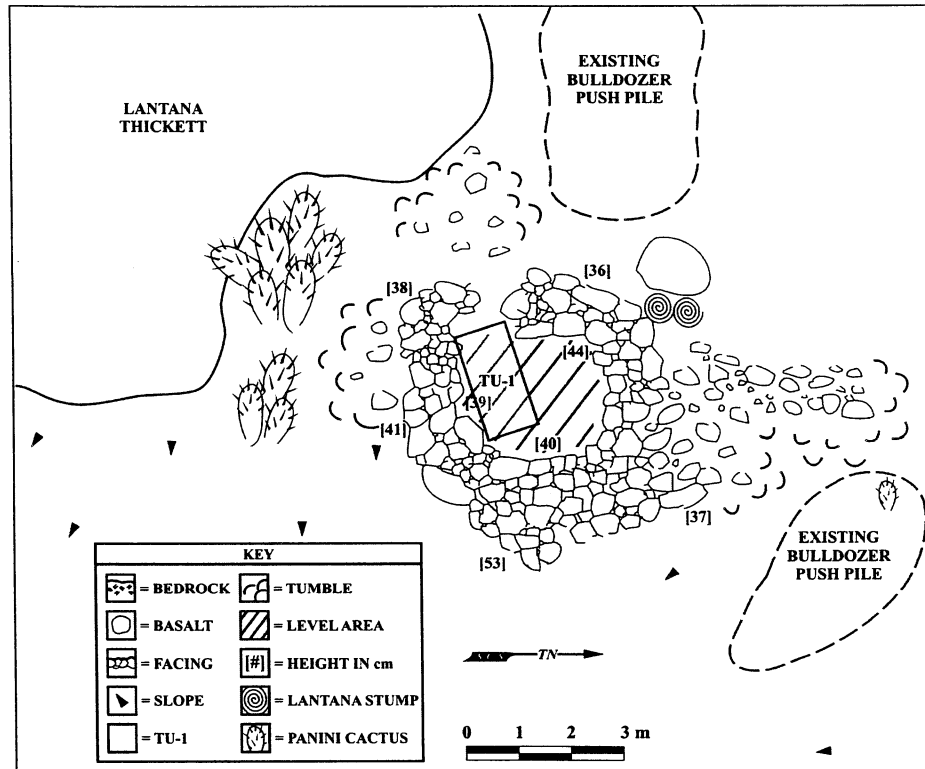


Figure 62: Road J, Site -3256, Feature 1 Plan View Map.

glass), marine shell, and charcoal were collected from this layer. Three scattered concentrations of charcoal were seen within Layer II. Ranging in thickness from 0.06-0.13 m, the charcoal concentrations tended to occur near the base of the layer. Layer III (0.20-0.43 mbs) was identified as a saprolitic layer composed of dark brown (10YR 3/3) to dark yellowish brown (10YR 4/4) silt loam with 50 percent cobbles and pebbles throughout. No cultural materials were observed in this layer.

Invertebrates

A fragment of *Cypraea* sp. was recovered from Layer II (0.06-0.23 mbs) within TU-1. The presence of this marine species several miles from the coast indicates its introduction into the site by humans, presumably as food items.

Artifacts

Volcanic glass and basalt debitage were recovered from both Layers I and II in TU-1. While few pieces of debitage were found in Layer I (0-0.08 mbs), the majority was found within Layer II (0.06-0.23 mbs). Also found within Layer II were volcanic glass cores and a few basalt flakes with polish.

Charcoal

Charcoal (25.6 g) was collected from Layer II of TU-1. Small amounts of charcoal (5.2 g and 4.3 g) were also recovered from the scattered charcoal concentrations located in this layer.

ROAD L RESULTS

ROAD L SUMMARY

Three sites were identified along Road L (see Figure 3). Portions of Site -3241 and Site -3228 were previously identified during Inventory Survey (Kolb *et al.* 1997) while Road L Feature 1 was newly discovered during the current project. Vegetation along Road L consisted of thick patches of lantana, agave, wattle, and *'ilima*.

Located along an outcrop edge, Site -3228 is a rock shelter interpreted as a temporary habitation/storage location (Kolb *et al.* 1997:A-110). This site was relocated during the current project, having been mapped and documented previously. Two ax handles were found inside the rock shelter when it was first documented. No testing was not conducted for this site.

Site -3241 was composed of two features, a circular enclosure and linear terrace. The site was mapped and documented previously, but not subject to testing (Kolb *et al.* 1997:A-145). Originally assessed as agricultural features, two test units were placed within the enclosure during the current project to test this hypothesis. The sparse amount of recovered cultural

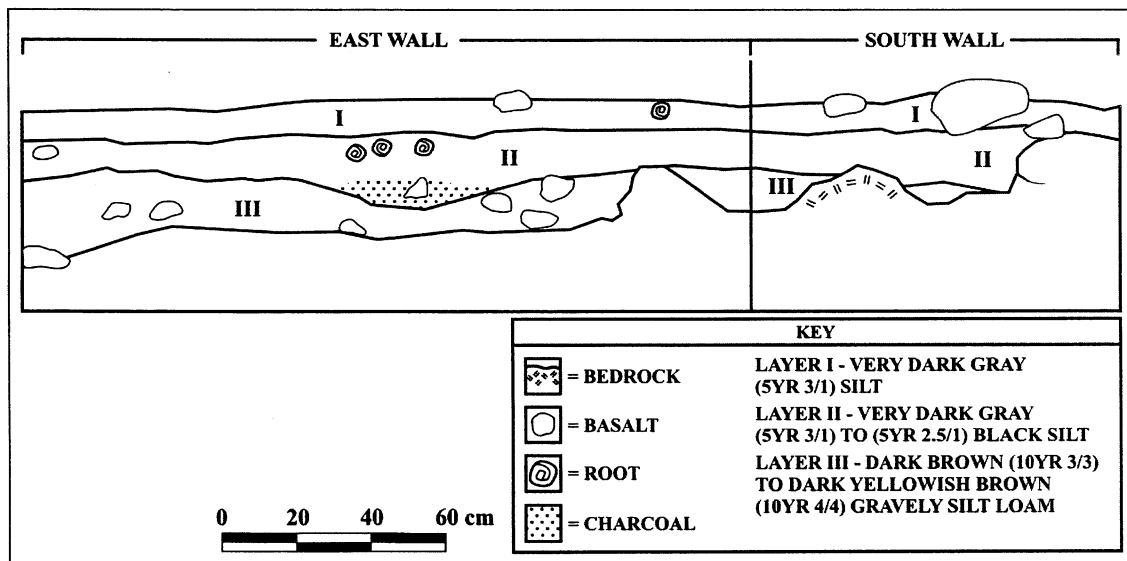


Figure 63: Road J, Site -3256, Feature 1, TU-1 Profile.

materials, as well as feature construction, reinforces the conclusion that the features were associated with traditional agriculture.

Road L Feature 1 is a square shaped enclosure that was not previously documented. This site is geographically associated with Site -3227. Feature 1 was mapped and two test units were placed within the enclosure during the current project. Excavation yielded a large amount of charcoal as well as three subsurface features (two ash lenses and a charcoal concentration).

Though no other cultural materials were observed, only a small portion of the enclosure interior was tested. The presence of the ash deposits and charcoal suggest this site to be associated with traditional habitation.

SITE -3241 FEATURE DESCRIPTION

Feature E-1 is a slightly disturbed, roughly circular enclosure (Figure 64). The feature diameter measures 4.9 m with a wall thickness of 0.60-1.10 m. The enclosure walls were constructed of small to large cobbles stacked 2-3 courses high. Facing is present on portions of both the exterior and interior enclosure walls, both which attain a maximum height of 0.80-0.95 m above the surface. Portions of the walls have been partially tumbled by thick vegetation growth of lantana, agave, and wattle trees. TU-1 and TU-2 were excavated within the interior of Feature E-1. Feature T-1 is a linear terrace constructed of small to large cobbles. Approximately 5.0 m long (northwest-southeast axis), this feature directly abuts the western exterior wall of feature E-1. No test units were excavated at Feature T-1.

SITE -3241 EXCAVATION

Test Unit 1 and 2 (TU-1 and TU-2)

Two test units (TU-1 and TU-2), each measuring 1.0 m by 1.0 m, were excavated in Feature E-1. The test units were placed side by side within the northern half of the enclosure, abutting interior walls. After removing tumbled rocks of the enclosure wall from the surface of the test units, excavation exposed two stratigraphic layers. Layer I (0-0.30 mbs) was composed of dark reddish brown (5YR 3/2) silt loam with few cobbles. Roots were abundant throughout the layer. A few pieces of faunal remains and marine shell were collected from this layer. Several pieces of charcoal were also observed, but not collected. Layer II (0.30-0.36 mbs) was identified as a saprolitic layer composed of a strong brown (7.5YR 4/6) silt loam with 30-40 percent cobbles throughout. No cultural materials were observed within this layer.

Invertebrates

A fragment of *Cypraea* sp. was recovered from Layer I (0-0.36 mbs) within TU-1 and TU-2.

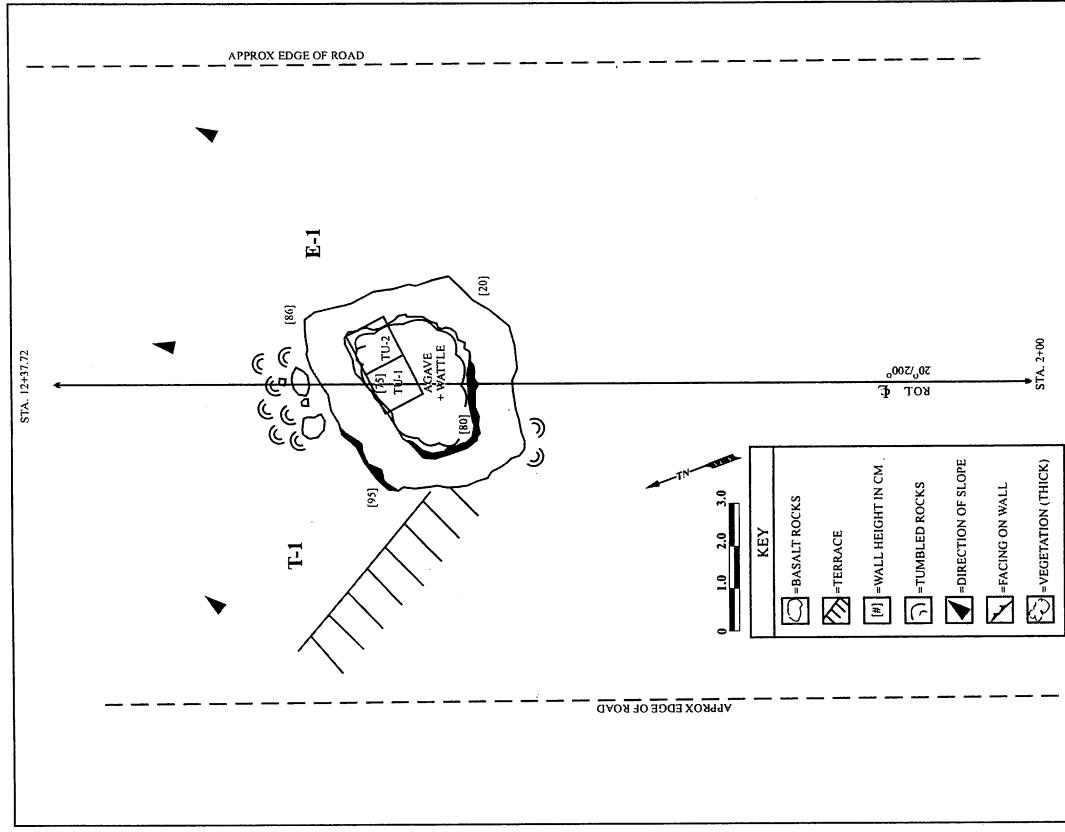


Figure 64: Road L, Site -3241, Feature E-1 and T-1 Plan View Map.

Charcoal

Trace amounts of charcoal were observed, but not collected from TU-1 and TU-2.

Vertebrates

Rattus/Mus sp. and small mammal remains were recovered from TU-1 and TU-2 within Layer I (0-0.36 mbs). The presence of *Rattus/Mus* sp. is usually indicative of a probable habitation site as this species is attracted to the presence of food remains.

ROAD L, FEATURE 1 DESCRIPTION

Feature 1 is a partially disturbed, square-shaped enclosure (Figures 65 and 66). The feature measures 4.5 m by 4.5 m (20.25 m²), with interior dimensions of 2.50 m by 2.25 m (5.62 m²). An 0.80 m wide opening is located within the eastern wall. The enclosure walls are 1-3 courses high (1.0 m wide) constructed of large cobbles and small boulders and attain a maximum height of 0.27-0.34 m above the surface. The north and west interior walls are predominantly constructed of flat, rectangular basalt slabs. Walls are slightly tumbled on both the exterior and interior of the enclosure due to cattle and deer activity, however facing is present along portions of the interior walls. Two test units (TU-1 and TU-2) were excavated in Feature 1, these again yielding only sparse amounts of cultural material. Feature 1 appears to be a small habitation feature, as evidenced by the possible hearth clean-out ash and the size, shape, and height of the structure.

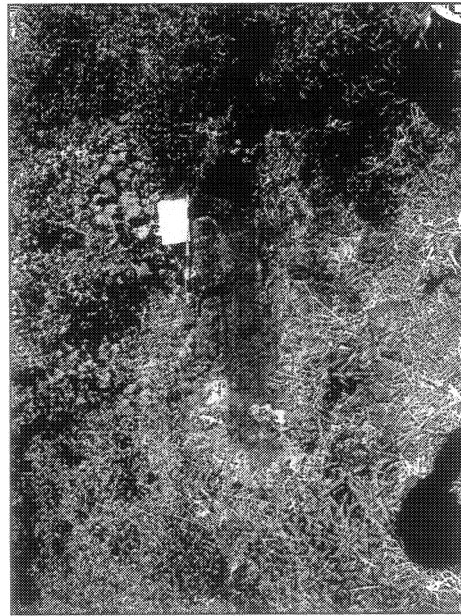


Figure 65: Road L, Feature 7, View to West.

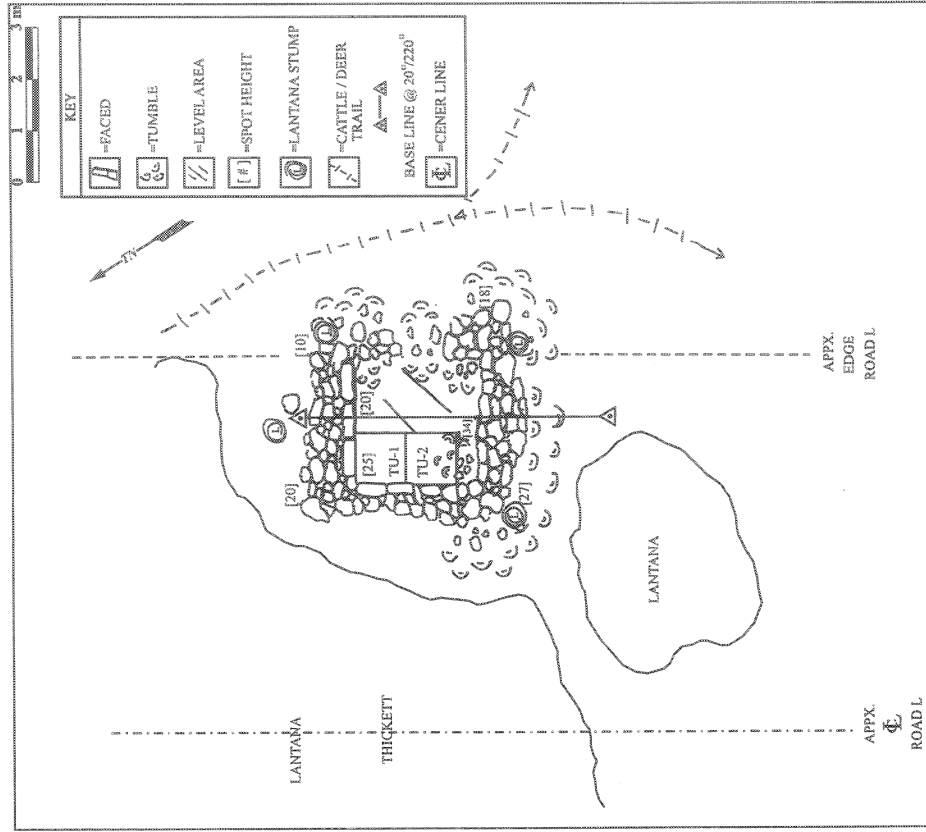


Figure 66: Road L, Site -3227, Feature 1 Plan View.

ROAD L, FEATURE 1 EXCAVATION

Test Unit 1 and 2 (TU-1 and TU-2)

Two test units (TU-1 and TU-2), each measuring 1.0 m by 1.0 m, were excavated in Feature 1. The test units were positioned within the feature to examine wall architecture and to test the presence/absence of cultural material. The test units were placed within the interior of the enclosure with TU-1 abutting both the northern and western interior walls. TU-2 was placed along side the first test unit abutting the western interior wall. Excavation of these units demonstrated that the north and west walls extend approximately 0.11 m to 0.16 m below the ground surface, into the first stratigraphic layer.

Two stratigraphic layers were exposed during excavation of these two units (Figure 67). Layer I (0-0.39 mbs) was composed of dark brown (7.5YR 3/2) compact silt with few stones and roots throughout. Charcoal was collected from Layer I in both units. No other cultural materials were observed within this layer. Three subsurface features were identified within Layer I. SSF 1.A and 1.B were identified at the base of Layer I in the northwest corner of TU-1. SSF 1.A (0.32-0.35 mbs) was composed of brown (7.5YR 4/4) compact ash. SSF 1.B (0.35-0.38 mbs) was composed of black (7.5YR 2.5/1) compact ash. Testing showed these to be two thin ash lenses that slightly intruded into the surface of Layer II. SSF 2.A (0.12-0.17 mbs) was an amorphous charcoal concentration located in the northeast corner of TU-2 and slightly into the southeast corner of TU-1. Due to their shallow nature, all three subsurface features appear to be caused by the dumping of ash/charcoal; they may represent the cleaned remnants of a hearth. Layer II (0.39-0.50 mbs) was composed of dark reddish brown (5YR 2.5/2) highly compact silt with few stones. No cultural materials were observed. This layer terminated upon the natural sterile bedrock.

Charcoal

Charcoal was recovered from Layer I in both test units. TU-1 (0-33 cmbs) produced large quantities of charcoal (101.1 g) while TU-2 also yielded an amount of 68.6 g.

ROAD M RESULTS

ROAD M SUMMARY

No sites were identified along Road M, this road corridor occurring in the northwestern portion of the project area (see Figure 3). Only a small portion of Site -3245 (T-1) occurred near this road corridor. Site -3245 was subject to Data Recovery (Dega *et al.* in preparation). Road M is proposed for locations that have completely clear ground surface and an intact dirt road running near the proposed road.

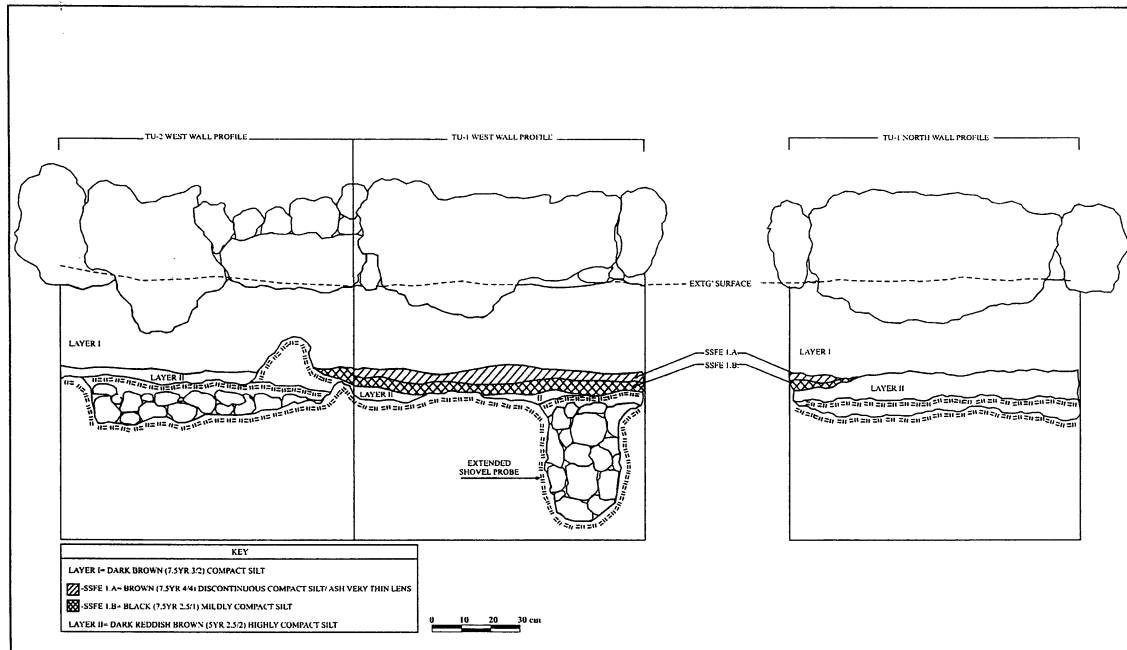


Figure 67: Road L, Site -3227, Feature 1, TU-1 and TU-2 Profile.

DISCUSSIONS AND CONCLUSIONS

A total of nine (9) roads were surveyed during this phase of revised Inventory Survey: Road A, E, F, G (inclusive of G-1, G-2, G South Run, G North Loop), H, I, J, L, and M (inclusive of M-1 and M-2). Only Road M failed to contain sites/features. All other roads contained both previously documented (Kolb *et al.* 1997) or previously unidentified sites/features.

A total of thirty-five (35) new features associated with nine (9) sites were identified and recorded to various degrees during this revised survey. A total of eighteen (18) previously identified sites were re-located in road corridors during this road survey. The population of newly recorded features (N=35) consists of enclosures, C-shapes, U-shapes, walls, terraces, mounds, alignments, platforms, lava tubes, rock shelters, and modified outcrops, these respectively related to habitation, agriculture, and boundary functions. One burial was identified during testing (Site -3272). All the features investigated herein are associated with traditional times, no historic sites or artifacts having been recovered during this revised Inventory Survey.

The following provides a summation of cultural materials recovered during surface survey and excavation at the various features within the various road corridors.

ARTIFACTS

Traditional artifacts were recovered from four road corridors during this project: Roads A, E, F, and J. These traditional artifacts had a total count of 282 items and consisted of 265 basalt items (93.97%), 16 volcanic glass items (6.67%), and one coral artifact (0.36%).

The basalt artifacts were generally based on course grained, non-glassy, basalt. Of the 265 basalt items recovered, 160 (60.38%) were non-diagnostic flakes and 83 (31.32%) were diagnostic flakes. The remaining 22 basalt artifacts comprised 8.30% of the basalt artifacts recovered, and included 13 flakes with polish, four cores, two edge altered flakes, one graver, one adze fragment, and one adze fragment utilized as a core. The 16 volcanic glass artifacts were comprised of eight non-diagnostic flakes, seven diagnostic flakes, and one core. The single coral artifact consisted of an abrader fragment.

The artifacts recovered from this project represent a limited number of tasks. The majority of the basalt debitage recovered was composed of course grained, non-glassy, material. This quality of material is not commonly utilized in the production of adzes and suggests that these flakes were produced by reducing basalt nodules and were intended to be utilized as expedient cutting and scraping processing tools. The four basalt cores, also comprised of course

grained material, further support this interpretation. In the same manner, the two edge altered flakes, the re-worked adze fragment, and the volcanic glass artifacts all represent an expedient processing tool manufacturing process. Given that no adze blanks or preforms were recovered, the 13 flakes with polish may also reflect this expedient tool process.

Only two of the recovered artifacts reflect manufacturing tasks. The basalt graver could have been used to notch or grove materials such as wood, bone, or shell. The graver tip could also be used as an awl to produce perforations in various objects. However, use-wear analysis of the graver tip did not identify the edge rounding expected by such a manufacturing activity. The coral abrader may have been utilized to smooth and shape a wide range of materials and artifacts.

VERTEBRATE REMAINS

Five road corridors (Roads A, E, F, J, and L) yielded vertebrate remains, with a majority from Road A. A fairly diverse assemblage was acquired through excavation, although vertebrate frequency was fairly low, this perhaps symptomatic of the limited nature of testing during this phase of work. As expected within an upland setting, terrestrial species dominated the assemblage, the largest weights of material, in descending order, including pig (48 g), bird (31.1 g), rat (0.9 g), other (2.6 g), fish (0.5 g), and dog remains (0.4 g). Bird remains were most ubiquitous. The pattern for low frequency of remains and species of remains present in this sample mirrors larger samples (see Dega *et al.* 2004; see also Kolb *et al.* 1997). The very low presence of rat and dog remains is somewhat surprising, given its higher frequency during previous projects (*ibid.*). Yet, sampling may have determined this lean recovery. The small amount of fish remains is not disconcerting as fish is not a localized resource for the uplands. The presence of fish remains suggests overland trade (upland-lowland trade) or simple importation of the good. The quantity of pig remains from Feature 1 in Road A suggests that the enclosure may have been utilized as a men's *hale*, not merely "habitation" as suggested by more encompassing terminology.

INVERTEBRATE REMAINS

This category of remains is significant simply for the fact that all recovered items were marine-based species. Again, this shows a semi-upland/coastal dichotomy of resources. Invertebrate remains were minimal in frequency yet were *present* at several features, this in itself accounting for importing of coastal resources through trade/exchange or tribute perhaps.

Five road corridors contained excavated sites yielding invertebrate remains: Roads A, E, F, J, and L. A majority of the remains were recovered from Road A and Road F, this the likely product of more testing conducted at specific features in these two corridors (e.g., Feature 1,

Road A). Overall, a total of only 15 g of invertebrate remains were recovered, almost all of which were marine shell fragments. This low frequency is not surprising given the upland location of the project area. The dominant recovered species included Cellana, Echinoidea, and Tellina, all near coastal species. The diversity of the recovered marine shell was fairly high for this upland location, with a total of ten shell species having been recovered, albeit in very small quantities.

BOTANICALS

Previous research in the uplands led to the recovery of a large quantity of various woody plant species (see Dega *et al.* 2004, a study completed for neighboring Keokea). The vast majority of these species were identified as indigenous to the Hawaiian Islands. The samples were mainly wood charcoal and *kukui* nut, the same types of materials recovered during present excavations. Wood and seed identification was not completed for this project and only counts are provided.

Charcoal and *kukui* nut was collected from excavations occurring in Roads A, E, F, J, and L. A total of 845.4 g of charcoal and 9.7 g of *kukui* nut were recovered from the various excavations. While identification of the wood species would have been very informative, several patterns were evident in this sample. First, almost each excavated unit yielded even sparse amounts of charcoal; few units were completely sterile. Second, the largest quantity of charcoal and *kukui* nut came from features subject to the most excavation, an obvious pattern. Third, almost all the charcoal was not recovered in isolation; artifacts and other cultural remains such as vertebrates and invertebrates were commingled with the charcoal. The charcoal and cultural remains defined the feature cultural strata. Fourth, several units yielded much more charcoal than others. This signifies the presence of a hearth in the feature for food preparation. Finally, the small amount of charred *kukui* nut is not rare for this area (see Dega *et al.* 2004). This charcoal and *kukui* assemblage is being held at the laboratory for potential identification and submission for radiocarbon dating in the future.

RELATIVE DATING

Based solely on feature construction and cultural resources recovered during various excavations of the road corridor sites, a definitive pattern can be seen: all sites are pre-contact in construction and occupation. The primary point of evidence is that no historic artifacts of any form were recovered from the surface or through testing various features. This is essentially in keeping with the results of Inventory Survey (Kolb *et al.* 1997) and Data Recovery (Dega *et al.* in preparation). While the features appeared to be associated with pre-Contact times, there has not yet been an absolute chronology established for these sites/features. In other terms, these

sites may date between the A.D. 1200s to the late A.D. 1700s. Samples amenable to processing dates are being curated at the laboratory in the event dating may occur in the future.

BURIALS

One human burial was identified during excavation work in support of this revised Inventory Survey research. A single individual was identified in Feature 1 of Road F. This feature was a platform not previously recorded as part of Site -3272 (Kolb *et al.* 1997:B-315-316). The present inventory of remains consists of the innominate, two tibia, and two fibula, these remaining *in situ*. The remainder of the burial was not cleared for analysis at this writing. Based on the nature of the feature (platform), associated artifacts (few, lithic flakes), and the absence of some artifact classes (historic materials such as metal nails), this single adult, female burial has been interpreted to be associated with traditional times. This burial will be subject to a burial treatment plan in which mitigation options will be discussed.

To date, one burial was discovered during Inventory Survey (Kolb *et al.* 1997) and three other burials were identified during Data Recovery (Dega *et al.* in preparation). None of these four burials were identified in road corridors and will likely be preserved in place. All four were associated with traditional times, as based on associated context and artifact data. Thus, a total of five burial loci are now known for the current project area.

SITE/FEATURE ARCHITECTURE

As noted in Dega *et al.* (1994) and based on the calculations of Brown *et al.* (1989:14), the built upland landscape was formalized primarily through enclosure architecture. In Kōōkea, for example, 139 features or 65.88% of all features recorded during Inventory Survey were enclosures. The second most frequent class of formal types was overhangs (9.95%), followed by terraces (8.05%), walls (7.58%), and platforms (2.84%). In the present study, this pattern seems to again suit this pattern, albeit at a smaller scale and within fixed points (planned roads) on the landscape. Within the present site population, enclosures and terraces are the most frequent formal architectural types occurring in planned road corridors. Linear terraces and walls may be over-represented though as they cross the project area as networks and would have an improved chance of occurring in road corridors, this versus small enclosures which did not occupy as much transverse space.

When evaluating this small population of features, feature architecture was fairly homogenous, with the little variation relating to structural depth and more formalization through

wall facing. Structures were built either on or incorporating portions of natural bedrock or were free-standing within the area's shallow soil deposits. Limited testing revealed that most site

architecture was based on or near the surface or in Layers I or II of the soil profile. In most instances herein, site architecture was directly correlated with a cultural deposit; however, in some cases, a sterile soil layer was present between architecture and underlying cultural deposits. Another pattern, also supported by the neighboring Keokea work (Dega *et al.* 2004) seemed to be that cultural activity was present at some site loci prior to being formalized through architecture at a later date. This cannot be accurately proven herein as no radiocarbon dates have been acquired. Of additional interest was that site architecture, predominantly composed of basalt cobbles and boulders, appears fairly consistent along the entire Kula belt from Waiohuli through Kōkeā.

OVERVIEW SUMMARY

A total of thirty-five (35) new features were documented during this revised Inventory Survey. Survey, feature recordation, and limited testing was conducted within nine road corridors. Eighteen (18) previously identified sites (Kolb *et al.* 1997) occur in the nine road corridors. A total of nine (9) sites contained features not previously recorded during the original work. The goal of this revised survey was to locate and document all features occurring within proposed road corridors of the Waiohuli parcel. Features not previously identified or recorded during original Inventory Survey were subject to recordation and limited testing. Thus, through this project, every archaeological site or feature occurring within proposed road corridors has now been recorded to the appropriate Inventory Survey level. The significance of these sites/features is present below, with recommendations as to any mitigation also proposed herein.

SIGNIFICANCE ASSESSMENTS

A total of 35 newly identified features were documented during this Revised Inventory Survey. This total is associated with nine (9) sites previously recorded during Inventory Survey in 1997 (Kolb *et al.* 1997). The total number of previously identified sites evaluated within this study consists of 18 sites. The following table illustrates State Site Number, the number of newly identified features at the respective site, original site significance assessment (from Kolb *et al.* 1997: D2-D15), and revised site significance assessment.

Table 2: Site Number, Number of Previously Unrecorded Features Associated with Site, Original Significance Assessment, Revised Significance Assessment

Site Number	Number of Previously Unrecorded Features	Original Significance Assessment	Revised Significance Assessment
3219	0	Criterion D; DR	Criterion D; DR
3221	3	Completed, NLS	Completed, NLS
3222	6	Criterion D; DR	Criterion D; DR
3223	0	NLS; No Further Work	NLS; No Further Work
3224	0	Criterion D; DR	Criterion D; DR
3227	1	Criterion D; DR	Criterion D; DR
3228	0	Completed	Completed
3241	0	Criterion D; NLS	Criterion D; NLS
3246	0	Criterion D; NLS	Criterion D; NLS
3256	1	Criterion d; DR	Criterion d; DR
3257	3	Criterion D; DR	Criterion D; DR
3263	0	Completed, NLS	Completed, NLS
3268	2	Criterion D; NLS	Criterion D; NLS
3269	4	Criterion D; DR	Criterion D; DR
3267	0	Criterion d; DR	Criterion d; DR
3272	1	Criterion D; NLS	Criterion D; NLS
3274	0	Criterion D&E; Feature 1	Criterion D&E; Feature 1
3280	14	Burial Treatment	Burial Treatment
NLS=No Further Work		Criterion D; DR	Criterion D; DR
DR=Data Recovery		Criterion D; DR	Criterion D; DR

As illustrated in Table 2 (Column 3), two of the original Inventory Survey sites were not recommended for any further work. The remaining 16 sites were recommended for Data Recovery. These 16 sites were all considered for recent Data Recovery work (Dega *et al.* -in preparation). Of the 16 sites, four sites (Sites -3219, -3223, -3227, and -3257) were selected for Data Recovery. The other 12 sites have been re-located during the current road survey work and documented through mapping and/or excavation. The revised significance assessments for the sites are presented in Column 4. Only one site (Site -3272) requires further work, that being Feature 1 at Site -3272 which requires burial treatment. The feature is significant under Criteria D and E. Four of the sites have been subject to Data Recovery and will be addressed in that report (Dega *et al.* -in preparation). No further work beyond Monitoring is recommended for the remaining 13 sites.

RECOMMENDATIONS

Of the total site population of eighteen (18) occurring within proposed road corridors, only one site is recommended for further work, this being in the form of burial treatment. Site - 3272, Feature 1 contained a single human burial. This feature will be addressed in a Burial Treatment Plan covering the entire project area. A total of five burials occur in the project area, one of which is Site -3272, Feature 1.

Archaeological Monitoring is recommended during construction of the road corridors as multiple sites occur in the proposed roads and cultural materials associated with these sites may be recovered to further understand the sites. There is also the possibility that inadvertent burials may be identified both within feature architecture and unaffiliated with known feature architecture. Monitoring will ensure that any identified remains will be appropriately documented and preserved. An Archaeological Monitoring Plan will be prepared for SHPD review prior to the initiation of road work in the project area.

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APPENDIX A: ROAD A LABORATORY ANALYSIS

ROAD A All Midden Inventory									
Field Bag	Site	Feature	Unit	Layer	Depth	Collected Material	Measurements	Count	Remarks
1	3280	E-7	TU-2	Hearth	5-39 cmbs	Basalt Debitage	-	4	Two IF; 1 SF; 1 NDF
1	3280	E-7	TU-2	Hearth	5-39 cmbs	Basalt Flakes with Polish	See Trad. Art. Inventory	2	One polished surface
1	3280	E-7	TU-2	Hearth	5-39 cmbs	Volcanic Glass Debitage	-	1	One NDF
2	3280	E-7	TU-2	I	5-30 cmbs	Basalt Flake with Polish	See Trad. Art. Inventory	1	One polished surface; obtained from unit south half
2	3280	E-7	TU-2	I	5-30 cmbs	Basalt Flake with Polish	See Trad. Art. Inventory	1	Two polished surfaces; very thin piece; obtained from unit south half
2	3280	E-7	TU-2	I	5-30 cmbs	Charcoal	1.6 g	-	Obtained from unit south half
2	3280	E-7	TU-2	I	5-30 cmbs	Invertebrates	0.7 g	-	Obtained from unit south half
3	3280	E-7	TU-2	I	5-20 cmbs	Basalt Debitage	-	1	One NDF; obtained from unit north half
3	3280	E-7	TU-2	I	5-20 cmbs	Basalt Flakes with Polish	See Trad. Art. Inventory	2	One polished surface; obtained from unit north half
3	3280	E-7	TU-2	I	5-20 cmbs	Basalt Flake with Polish	See Trad. Art. Inventory	1	NDF; 1 polished surface; obtained from unit north half
4	3280	E-7	TU-2	Hearth	14-30 cmbs	Basalt Debitage	-	2	Two IF
4	3280	E-7	TU-2	Hearth	14-30 cmbs	Charcoal	2.1 g	-	-
5	3280	E-7	TU-2	Hearth	-	Soil Sample	≈ 2041.2 g	-	-
6	3280	E-7	TU-1	-	50 cmbs	Edge Altered Basalt Flake	See Trad. Art. Inventory	1	Based on NDF; 1 unifacial, retouched; concave edge; 3.06 cm; artifact found 70 N/80 E
7	3280	E-7	TU-1	-	50-60 cmbs	Charcoal	0.8 g	-	-
7	3280	E-7	TU-1	-	50-60 cmbs	Coral	2.4 g	1	Non-worked
7	3280	E-7	TU-1	-	50-60 cmbs	Vertebrates	10.0 g	-	cf. Procellariidae
8	3280	E-6	TU-1	I	0-10 cmbs	Charcoal	0.4 g	-	-
8	3280	E-6	TU-1	I	0-10 cmbs	Vertebrates	36.1 g	-	cf. Sus scrofa
9	3280	E-6	TU-1	II	12-40 cmbs	Basalt Core	See Trad. Art. Inventory	1	Nodule; multiple, unprepared striking platforms
10	3280	E-6	TU-1	II	12-40 cmbs	Basalt Debitage	-	35	Four IF; 7 SF; 3 PF; 21 NDF
10	3280	E-6	TU-1	II	12-40 cmbs	Basalt Flake with Polish	See Trad. Art. Inventory	1	One NDF; 1 polished surface
10	3280	E-6	TU-1	II	12-40 cmbs	Charcoal	80.5 g	-	-
10	3280	E-6	TU-1	II	12-40 cmbs	Coral	90.5 g	9	Non-worked
10	3280	E-6	TU-1	II	12-40 cmbs	Invertebrates	0.1 g	-	Non-diagnostic Echinoidea
11	3280	U-1	TU-1 & 2	I	0-30 cmbs	Charcoal	2.1 g	-	-
12	3280	E-6	TU-2	II	13-50 cmbs	Basalt Debitage	-	111	Twenty-eight IF; 2 SF; 81 NDF
12	3280	E-6	TU-2	II	13-50 cmbs	Coral Abrader	See Trad. Art. Inventory	1	Utilized on 2 faces
12	3280	E-6	TU-2	II	13-50 cmbs	Charcoal	79.9 g	-	-
12	3280	E-6	TU-2	II	13-50 cmbs	Coral	34.8 g	15	Non-worked
12	3280	E-6	TU-2	II	13-50 cmbs	Invertebrates	0.3 g	-	Conus sp.
12	3280	E-6	TU-2	II	13-50 cmbs	Invertebrates	0.1 g	-	Non-diagnostic marine shell
12	3280	E-6	TU-2	II	13-50 cmbs	Vertebrates	0.3 g	-	Fish
12	3280	E-6	TU-2	II	13-50 cmbs	Vertebrates	0.1 g	-	Bird
13	3280	E-6	TU-2	II (Top)	14 cmbs	Basalt Debitage	-	1	One NDF

14	3280	E-6	TU-2	II, III, IV	45-70 cmbs	Basalt Debitage	-	14	One SF; 12 NDF
14	3280	E-6	TU-2	II, III, IV	45-70 cmbs	Basalt Graver	See Trad. Art. Inventory	1	Based on IF; graver tip formed by join of 2 edges which were retouched to form tip. Tip is 0.8 cm long.
14	3280	E-6	TU-2	II, III, IV	45-70 cmbs	Edge Altered Basalt Flake	See Trad. Art. Inventory	1	Based on IF; 1 altered edge; unifacial, concave, retouched; 3.79 cm
14	3280	E-6	TU-2	II, III, IV	45-70 cmbs	Coral	3.5 g	1	Non-worked
15	3280	U-1	TU-1 & 2	I	0-30 cmbs	Volcanic Glass Debitage	-	1	One NDF
15	3280	U-1	TU-1 & 2	I	0-30 cmbs	Clear Glass Sherd	-	1	-
16	3280	E-6	TU-4	Surface	-	Non-Artifact	-	1	Basalt
17	3280	E-6	TU-4	-	64 cmbs	Non-Artifact	-	1	Basalt
18	3280	E-6	TU-4	-	65 cmbs	Basalt Core Fragment	-	1	Large piece of tabular core; single prepared striking platform; artifact; artifact found 45 E/45 N
19	3280	E-6	TU-4	-	79 cmbs	Reworked Basalt Adze Fragment	-	1	Large section of adze with 1 polished surface; most of the piece has been flaked; possible use as a core; artifact found 80 E/15 N
20	3280	E-6	TU-4	-	60 cmbs	Basalt Core Fragment	-	1	Large fragment; single unprepared striking platform; artifact found 90 E/15 N
21	3280	E-6	TU-4	-	0-115 cmbs	Basalt Debitage	-	17	Seven IF; 10 NDF
21	3280	E-6	TU-4	-	0-115 cmbs	Basalt Adze Fragment	-	1	Mid-section fragment; 2 polished surfaces
21	3280	E-6	TU-4	-	0-115 cmbs	Invertebrates	0.3 g	-	<i>Cypraea</i> sp.
21	3280	E-6	TU-4	-	0-115 cmbs	Vertebrates	0.2 g	-	Fish
21	3280	E-6	TU-4	-	0-115 cmbs	Vertebrates	0.3 g	-	<i>Rattus/Mus</i> sp.
21	3280	E-6	TU-4	-	0-115 cmbs	Vertebrates	1.9 g	-	Medium mammal
21	3280	E-6	TU-4	-	0-115 cmbs	Charcoal	190.5 g	-	-
22	3280	E-6	TU-4	-	90 cmbs	Soil Sample	≈ 464.1 g	-	Sample from unit sw quadrant
23	3280	E-6	TU-5	I	40-80 cmbd	Basalt Debitage	-	1	One PF
23	3280	E-6	TU-5	I	40-80 cmbd	<i>Kukui</i>	9.5 g	-	-
23	3280	E-6	TU-5	I	40-80 cmbd	Charcoal	9.9 g	-	-
23	3280	E-6	TU-5	I	40-80 cmbd	Vertebrates	0.1 g	-	<i>Rattus/Mus</i> sp.
23	3280	E-6	TU-5	I	40-80 cmbd	Vertebrates	6.2 g	-	<i>Sus scrofa</i>

PF = Primary Flake; IF = Interior Flake; SF = Secondary Flake; NDF = Non-Diagnostic Flake

APPENDIX B: ROAD E LABORATORY ANALYSIS

ROAD E All Midden Inventory							Count	Remarks
Field Bag	Site	Feature	Unit	Layer	Depth	Collected Material		
1	3267	P-1	TU-1	II	-	Charcoal	15.7 g	-
2	3280	3	TU-1	I	18-40 cmbd	Basalt Debitage	-	One IF; 1 SF; 2 NDF
2	3280	3	TU-1	I	18-40 cmbd	Basalt Flakes with Polish	See Trad. Arts. Inventory	One polished surface
2	3280	3	TU-1	I	18-40 cmbd	Basalt Flake with Polish	-	One polished surface; NDF
2	3280	3	TU-1	I	18-40 cmbd	Charcoal	3.8 g	-
2	3280	3	TU-1	I	18-40 cmbd	Invertebrates	1.7 g	- <i>Cellana</i> sp.
2	3280	3	TU-1	I	18-40 cmbd	Invertebrates	0.1 g	- Non-diagnostic Echinoidea
2	3280	3	TU-1	I	18-40 cmbd	Vertebrates	8.2 g	- Bird
2	3280	3	TU-1	I	18-40 cmbd	Vertebrates	2.0 g	- <i>Sus scrofa</i>
3	3280	3	TU-1	II	40-54 cmbd	Basalt Debitage	-	One SF; 1 NDF
3	3280	3	TU-1	II	40-54 cmbd	Charcoal with Matrix	15.7 g	-
3	3280	3	TU-1	II	40-54 cmbd	Invertebrates	< 0.1 g	- <i>Amasra hutchinsoni</i>
3	3280	3	TU-1	II	40-54 cmbd	Invertebrates	0.9 g	- <i>Amasra cylindrica</i>
3	3280	3	TU-1	II	40-54 cmbd	Invertebrates	0.1 g	- <i>Amasra nucleola</i>
3	3280	3	TU-1	II	40-54 cmbd	Vertebrates	7.7 g	- <i>Gallus gallus</i>
3	3280	3	TU-1	II	40-54 cmbd	Vertebrates	3.7 g	- <i>Sus scrofa</i>
4	3280	3	TU-1	II	50-54 cmbd	Soil Sample	≈ 158.1 g	-

PF = Primary Flake, IF = Interior Flake; SF = Secondary Flake; NDF = Non-Diagnostic Flake

APPENDIX C: ROAD F LABORATORY ANALYSIS

ROAD F All Midden Inventory							Count	Remarks
Field Bag	Site	Feature	Unit	Layer	Depth	Collected Material		
1	3272	P-1	TU-1	I	0-70 cmbs	Volcanic Glass Debitage	6	Three IF; 1 PF; 2 NDF
1	3272	P-1	TU-1	I	0-70 cmbs	Invertebrates	-	<i>Isognomon</i> sp.
1	3272	P-1	TU-1	I	0-70 cmbs	Invertebrates	-	Decapoda
1	3272	P-1	TU-1	I	0-70 cmbs	Invertebrates	-	<i>Heterocentrotus mammillatus</i>
1	3272	P-1	TU-1	I	0-70 cmbs	Invertebrates	-	Non-diagnostic Echinoidea
1	3272	P-1	TU-1	I	0-70 cmbs	Vertebrates	-	Bird
1	3272	P-1	TU-1	I	0-70 cmbs	Vertebrates	-	<i>Rattus/Mus</i> sp.
2	3272	P-1	TU-1	I	0-70 cmbs	Charcoal	-	-
3	3272	P-1	TU-1	I	0-70 cmbs	Basalt Debitage	11	Four IF; 2 SF; 5 NDF
3	3272	P-1	TU-1	I	0-70 cmbs	Invertebrates	-	<i>Tellina palatam</i>
4	3272	P-1.1	TU-1	-	25-46 cmbs	"Solidified Ash"	-	-
5	3272	P-1.2	TU-1	-	-	Charcoal	-	-
6	3272	P-1.2	TU-1	-	63-78 cmbs	Soil Sample	-	-
7	3272	P-1	TU-2	I	0-48 cmbs	Vertebrates	-	Elasmobranch
7	3272	P-1	TU-2	I	0-48 cmbs	Vertebrates	-	Small vertebrate
8	3272	P-1	TU-2	I	0-48 cmbs	Charcoal	-	-
9a	3280	ET-1	ST-1	I	0-34 cmbs	Soil Sample	-	-
9b	3280	ET-1	ST-1	II	34-45 cmbs	Soil Sample	-	-
9c	3280	ET-1	ST-1	III	45-80 cmbs	Soil Sample	-	-
10	3280	ET-1	ST-1	I	-	Basalt Core	-	-
10	3280	ET-1	ST-1	I	-	Basalt Debitage	1	Multiple, prepared striking platforms
							1	One IF; associated with 1 piece of fire affected basalt

PF = Primary Flake; IF = Interior Flake; SF = Secondary Flake; NDF = Non-Diagnostic Flake

APPENDIX D: ROAD J LABORATORY ANALYSIS

ROAD J All Midden Inventory										
Field Bag	Site	Feature	Unit	Layer	Depth	Collected Material	Measurements	Count	Remarks	
1	3246	P-1	TU-1	II	43-70 cmbs	Basalt Debitage	-	16	Six IF; 1 SF; 9 NDF	
1	3246	P-1	TU-1	II	43-70 cmbs	Charcoal	46.7 g	-	-	
1	3246	P-1	TU-1	II	43-70 cmbs	Vertebrates	<0.1 g	-	<i>Rattus/Mus</i> sp.	
1	3246	P-1	TU-1	II	43-70 cmbs	Vertebrates	0.4 g	-	<i>Canis familiaris</i>	
2	3246	P-1	TU-2	I	49-64 cmbs	Charcoal	12.9 g	-	-	
3	3246	P-1	TU-2	II	56-94 cmbs	Basalt Debitage	-	3	Three NDF	
3	3246	P-1	TU-2	II	56-94 cmbs	Volcanic Glass Debitage	-	1	One NDF	
3	3246	P-1	TU-2	II	56-94 cmbs	Charcoal	8.5 g	-	-	
3	3246	P-1	TU-2	II	56-94 cmbs	<i>Kukui</i>	0.2 g	-	-	
4	3246	P-1	TU-2	II	60-70 cmbs	Soil Sample	≈ 157.7 g	-	Sample from ash lens	
5	3256	1	TU-1	I/I	0-8 cmbs	Basalt Debitage	-	2	Two NDF	
5	3256	1	TU-1	I/I	0-8 cmbs	Volcanic Glass Debitage	-	1	One NDF	
6a	3256	1	TU-1	II/I	6-23cmbs	Basalt Debitage	-	14	Four IF; 2 SF (1 very large; 8 NDF	
6a	3256	1	TU-1	II/I	6-23cmbs	Basalt Flakes with Polish	See Trad. Arts. Inventory	2	One polished surface	
6a	3256	1	TU-1	II/I	6-23cmbs	Basalt Flake with Polish	-	1	One NDF; 1 polished surface	
6a	3256	1	TU-1	II/I	6-23cmbs	Volcanic Glass Debitage	-	7	One IF; 2 SF; 4 NDF	
6a	3256	1	TU-1	II/I	6-23cmbs	Volcanic Glass Core	See Trad. Arts. Inventory	1	Only 2 flake scars; single unprepared striking platform	
6a	3256	1	TU-1	II/I	6-23cmbs	Charcoal	25.6 g	-	-	
6a	3256	1	TU-1	II/I	6-23cmbs	Invertebrates	2.4 g	-	<i>Cypraea</i> sp.	
6b	3256	1	TU-1	II/I	7-20 cmbs	Charcoal	5.2 g	-	Sample #2	
6c	3256	1	TU-1	II/I	18-24 cmbs	Charcoal with Matrix	4.3 g	-	Sample #1	

PF = Primary Flake; IF = Interior Flake; SF = Secondary Flake; NDF = Non-Diagnostic Flake

PF = Primary Flake; IF = Interior Flake; SF = Secondary Flake; NDF = Non-Diagnostic Flake

APPENDIX E: ROAD L LABORATORY ANALYSIS

ROAD L All Midden Inventory								
Field Bag	Site	Feature	Unit	Layer	Depth	Collected Material	Measurements	Remarks
1	3227	1	TU-1	I	0/2-30/33 cm	Charcoal	101.1 g	-
2	3227	1	TU-2	I	0/2-39/42 cm	Charcoal	68.6 g	-
3	3241	E-1	TU-1 & 2	I	0-36 cmbs	Invertebrates	1.7 g	Cypraea sp.
3	3241	E-1	TU-1 & 2	I	0-36 cmbs	Vertebrates	0.3 g	Rattus/Mus sp.
3	3241	E-1	TU-1 & 2	I	0-36 cmbs	Vertebrates	0.3 g	Small mammal



Appendix E

TRAFFIC IMPACT ANALYSIS REPORT

TRAFFIC IMPACT ANALYSIS REPORT FOR

WAOIHULI HOMESTEAD COMMUNITY

IN WAOIHULI, MAUI, HAWAII

FINAL REPORT

Prepared For

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1. INTRODUCTION

Phillip Rowell and Associates prepared this Traffic Impact Analysis Report for the proposed Waiohuli Homestead Community in the Waiohuli area of Maui, Hawaii. This introductory chapter describes the proposed project, purposes of the traffic study, study methodology and order of presentation.

Project Location and Description

1. Waiohuli Homestead Community will be located along the west side of Kula Highway between the Kula Residential Lots and Keokea Farm Lots. The general location on Maui is shown in Figure 1.
2. Waiohuli Homestead Community will consist of 337 residential lots.
3. Primary access and egress will be via Lau'ie Drive, which is an existing roadway through the existing Kula Residential Lots north of the Waiohuli Homestead Community. Figure 2 is a preliminary subdivision plan indicating the location of Lau'ie Drive in relation to the project. The intersection of Lau'ie Road with Kula Highway is an unsignalized intersection with no separate left turn lanes into or out of the project. This study will determine the need for any improvements.
4. Secondary access and egress will be a new roadway through the Keokea Farm Lots. This roadway is designated Road B on the Keokea Farm Lot subdivision plan and is also shown on Figure 2.

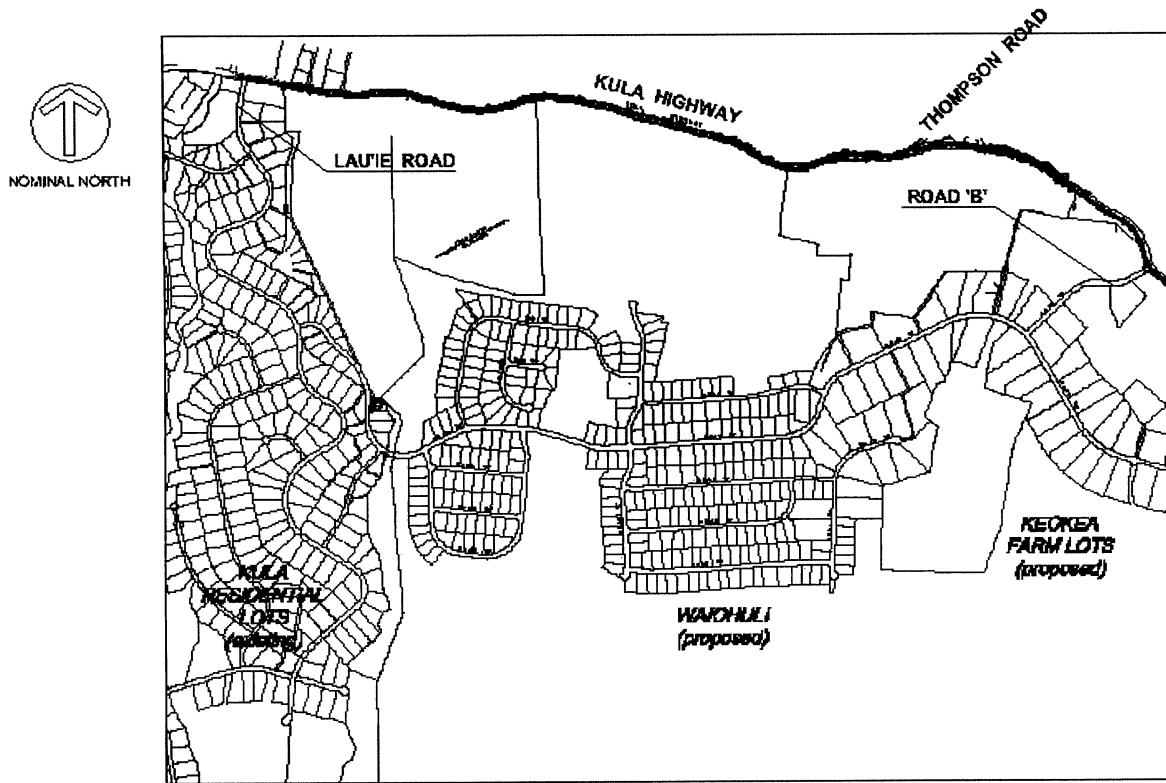


Figure 2
PRELIMINARY SITE PLAN

SOURCE: PBR HAWAII

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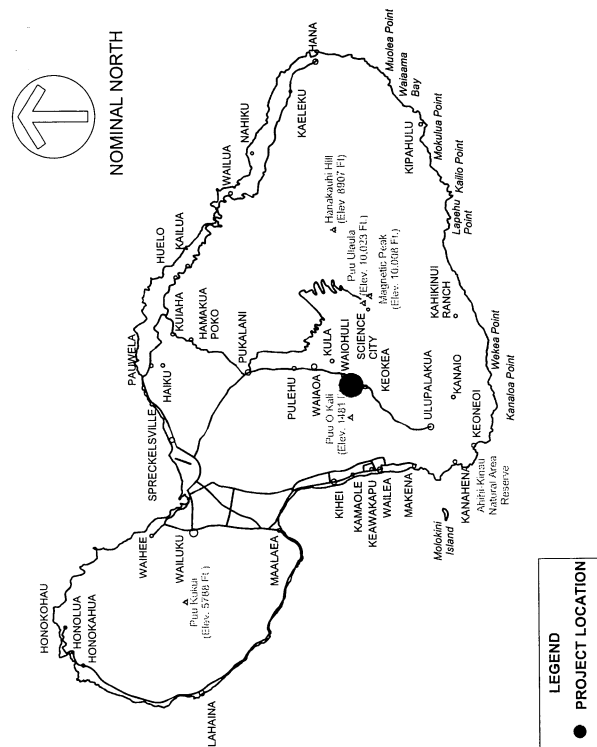


Figure 1
PROJECT LOCATION MAP

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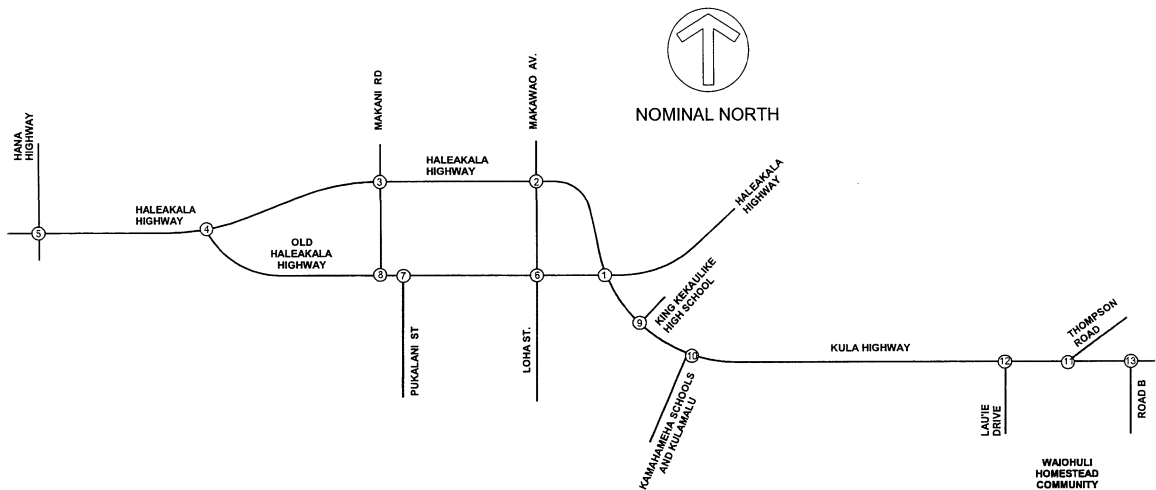


Figure 3
STUDY AREA AND STUDY INTERSECTIONS

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Shown on the site plan are the approximate north and the nominal north. The approximate north is oriented toward the true north. The nominal north refers to the orientation used for the level-of-service calculations. The nominal north is consistent with the level-of-service calculation outputs, report tables and report graphics.

Purpose and Objectives of Study

- 1. Determine and describe the traffic characteristics of project.
- 2. Quantify and document the traffic related impacts of project.
- 3. Identify and evaluate traffic related improvements required to provide adequate access to and egress from the project and to mitigate the project's traffic impacts.

Study Area

The study area is shown in Figure 3. The study area includes the following intersections, which are shown in the figure:

- 1. Haleakala Highway at Kula Highway/Old Haleakala Highway
- 2. Haleakala Highway at Makawao Avenue
- 3. Haleakala Highway at Makani Road
- 4. Haleakala Highway at Old Haleakala Highway
- 5. Haleakala Highway at Hana Highway
- 6. Old Haleakala Highway at Makawao Avenue and Loha Street
- 7. Old Haleakala Highway at Pukalani Street
- 8. Old Haleakala Highway at Makani Road
- 9. Kula Highway at King Kekaulike High School Entrance
- 10. Kula Highway at Kamehameha School Entrance and Kulamalu
- 11. Kula Highway at Thompson Road
- 12. Kula Highway at Laurie Drive
- 13. Kula Highway at Drive 'B'

Design Year

The design, or horizon, year of a project is the future year for which background traffic conditions are estimated. For this project, the anticipated opening or completion year is typically used as the design year. Because of the number of lots (337), it is anticipated that build-out will require several years.

As there is no timetable for build-out or completion of the project, it was decided to use 2010. This design year is consistent with recently completed traffic studies for other projects in the area and with recent direction from the County of Maui Department of Public Works. Use of 2010 as the design year will also result in consistency with future traffic forecasts of the other studies.

13. ¹ Institute of Transportation Engineers, *Transportation and Land Development*, 2nd Edition, Washington, D.C., 2002, p. 3-

Study Methodology

The following is a summary list of the tasks performed:

1. A site reconnaissance was performed to identify existing roadway cross-sections, intersection lane configurations, traffic control devices, and surrounding land uses.
2. Existing peak-hour traffic volumes for the study intersections were obtained and summarized.
3. Existing levels-of-service of the study intersections were determined using the methodology described in the *Highway Capacity Manual*.
4. A list of related development projects within and adjacent to the study area that will impact traffic conditions at the study intersections was compiled. This list included both development projects and anticipated roadway improvement projects.
5. Future background traffic volumes at the study intersections without traffic generated by the project were estimated.
6. Peak hour traffic that project will generate was estimated using trip generation analysis procedures recommended by the Institute of Transportation Engineers.
7. A level-of-service analysis for future traffic conditions with traffic generated by the project was performed.
8. The impacts of project generated traffic at the study intersections were quantified and summarized.
9. Locations where project generated traffic significantly impacts traffic operating conditions were identified.
10. Recommendations, improvements or modifications necessary to mitigate the traffic impacts of project generated traffic and to provide adequate access to and egress from the site were formulated.
11. A report documenting the conclusions of the analyses performed and recommendations was prepared.

Order of Presentation

Chapter 2 describes existing traffic conditions, the Level-of-Service (LOS) concept and the results of the LOS analysis of existing conditions.

Chapter 3 describes the process used to estimate 2010 background traffic volumes and the resulting background traffic projections. Background conditions are defined as future background traffic conditions without project generated traffic.

Chapter 4 describes the methodology used to estimate the traffic characteristics of the proposed project, including 2010 background plus project generated traffic.

Chapter 5 describes the impacts of project generated traffic, identifies potential mitigation measures and summarizes the traffic impact study.

2. EXISTING CONDITIONS

This chapter presents the existing traffic conditions on the roadways adjacent to the project site. The Level-of-Service (LOS) concept and the results of the LOS analysis for existing conditions are also presented. The purpose of this analysis is to establish the base conditions for the determination of the impacts of the project which are described in a subsequent chapter.

Existing Roadway and Traffic Conditions

The traffic characteristics of the roadways serving the project are summarized in Table 1.

A schematic of the existing roadway network serving the project is shown in Figure 4. Shown are the existing lane configurations and right-of-way controls of the study intersections.

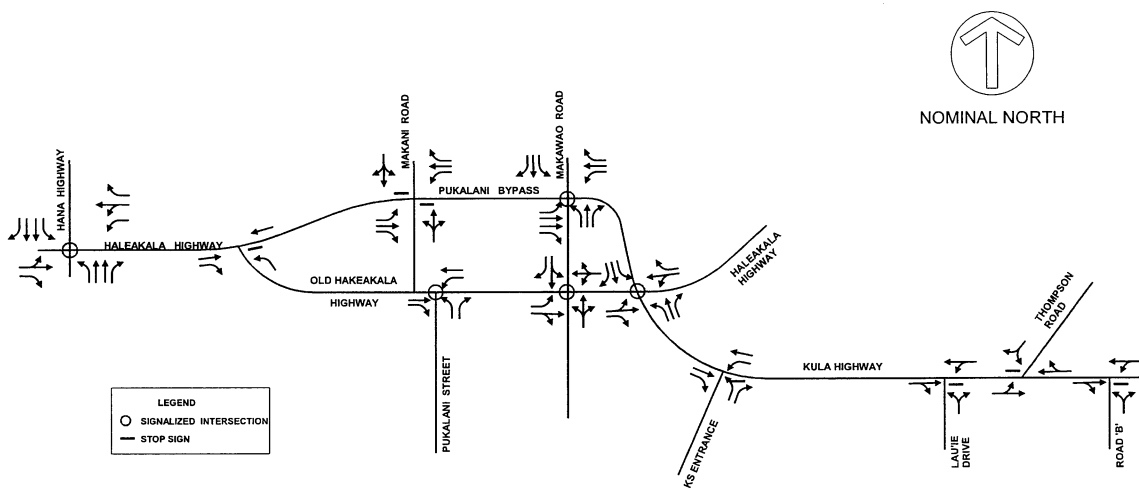


Figure 4
EXISTING ROADWAY NETWORK AND INTERSECTION CONFIGURATIONS

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Traffic Impact Analysis Report for Waiohuli Homestead Community

Table 1 Summary of Existing Roadways						
Roadway	Section	Jurisdiction	Number of Lanes	Divided	Approximate ADT	Posted Speed Limit
Hana Highway	South of Haleakala Highway	State	2	Yes	29,100	55
	North of Haleakala Highway	State	4	No	5,700	55
Haleakala Highway	Hana Highway to Old Haleakala Highway	State	3	No	26,000	55
	Old Haleakala Highway to Makani Road		4	Yes	14,400	45
	Makani Road to Makawao Avenue	State	4	Yes	10,000	45
	Makawao Avenue to Kula Highway		3	Yes	10,700	45
Kula Highway	East of Haleakala Highway	State	2	No	14,400	45
	Haleakala Highway to Makani Road		2	No	13,000	35
Old Haleakala Highway	Makani Road to Makawao Avenue	County	2	No	12,000	35
	Makawao Avenue to Kula Highway		2	No	4,300	35
Pukalani Street	South of Old Haleakala Highway	County	4	No	16,800	20
Makani Road	Haleakala Highway to Old Haleakala Highway	County	2	No	2,000	30
Makawao Avenue	Old Haleakala Highway to Haleakala Highway	County	2	No	6,700	30

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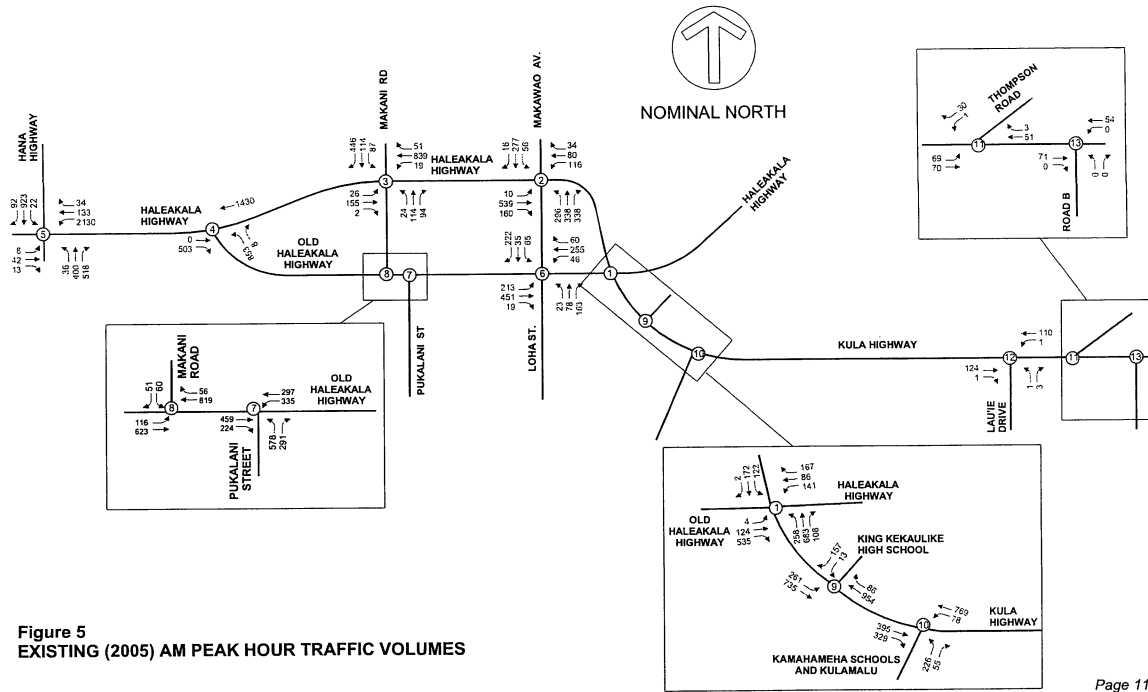


Figure 5
EXISTING (2005) AM PEAK HOUR TRAFFIC VOLUMES

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Existing Peak Hour Traffic Volumes

Existing peak hourly traffic volumes of the study intersections were obtained from field surveys conducted during September and October, 2004. The intersection of Kula Highway at Lauie Drive was counted in May, 2005. The traffic count schedule is shown in Table 2.

Intersection	AM Counts			PM Counts		
	Day	Date	Hours	Day	Date	Hours
Haleakala Hwy at Kula Highway	Friday	24 Sept 04	0630 to 0900	Friday	24 Sept 04	1530 to 1800
Haleakala Hwy at Makawao Av	Friday	10 Oct 04	0630 to 0900	Friday	10 Oct 04	1530 to 1800
Haleakala Hwy at Makani Rd	Friday	17 Sept 04	0630 to 0900	Friday	17 Sept 04	1530 to 1800
Haleakala Hwy at Old Haleakala Hwy	Monday	13 Sept 04	0630 to 0900	Monday	13 Sept 04	1530 to 1800
Haleakala Highway at Hana Hwy	Friday	17 Sept 04	0630 to 0900	Friday	17 Sept 04	1530 to 1800
Old Haleakala Hwy at Makawao Av	Friday	24 Sept 04	0630 to 0900	Friday	24 Sept 04	1530 to 1800
Old Haleakala Highway at Pukalani St	Friday	24 Sept 04	0630 to 0900	Friday	24 Sept 04	1530 to 1800
Old Haleakala Hwy at Makani Rd	Friday	24 Sept 04	0630 to 0900	Friday	24 Sept 04	1530 to 1800
Kula Hwy at King Kekaulike HS Entrance	Monday	20 Sept 04	0630 to 0900	Monday	20 Sept 04	1300 to 1500
Kula Highway at Kamaheha School Entrance	Monday	20 Sept 04	0630 to 0900	Monday	20 Sept 04	1530 to 1800
Kula Highway at Thompson Rd	Friday	1 Oct 04	0630 to 0900	Friday	1 Oct 04	1530 to 1800
Kula Highway at Lauie Drive	Friday	20 May 05	0700 to 0900	Friday	20 May 05	1530 to 1800

The morning and afternoon peak hourly traffic volumes are shown in Figures 5 and 6, respectively.

1. The traffic volumes include large trucks, buses and motorcycles.
2. The volumes shown are the peak hourly volume of each movement and not the peak hour of the total intersection. Therefore, the volumes shown represent a worse-case peak hour condition.
3. The traffic volumes of one intersection may not match those of the adjacent intersection. This is because adjacent intersections may have different peak hours and there may be driveways or minor streets between the intersections.

Figure 6
EXISTING (2005) PM PEAK HOUR TRAFFIC VOLUMES

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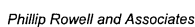
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Figure 6
EXISTING (2005) PM PEAK HOUR TRAFFIC VOLUMES

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Figure 6
EXISTING (2005) PM PEAK HOUR TRAFFIC VOLUMES



Unsignalized Intersections

Like signalized intersections, the operating conditions of intersections controlled by stop signs can be classified by a Level-of-Service from A to F. However, the method for determining Level-of-Service for unsignalized intersections is based on the use of gaps in traffic on the major street by vehicles crossing or turning through that stream. Specifically, the capacity of the controlled legs of an intersection is based on two factors: 1) the distribution of gaps in the major street traffic stream, and 2) driver judgement in selecting gaps through which to execute a desired maneuver. The criteria for Level-of-Service at an unsignalized intersection is therefore based on delay of each turning movement. Table 4 summarizes the definitions for Level-of-Service and the corresponding delay.

Table 4 Level-of-Service Definitions for Unsignalized Intersections⁽¹⁾

Level-of-Service	Expected Delay to Minor Street Traffic	Control Delay (Seconds)
A	Little or no delay	>10
B	Short traffic delays	10.1 to 15.0
C	Average traffic delays	15.1 to 25.0
D	Long traffic delays	25.1 to 35.0
E	Very long traffic delays	35.1 to 50.0
F	See note (2) below	>50.1

Notes:
 (1) Source: Highway Capacity Manual, 2000.
 (2) When demand volume exceeds the capacity of the lane, extreme delays will be encountered with queuing which may cause severe congestion affecting other traffic movements in the intersection. This condition usually warrants improvement of the intersection.

Level-of-Service Analysis of Existing Conditions

The results of the Level-of-Service analysis for the signalized intersections are shown in Table 5. Shown in the table are the volume-to-capacity ratios, average control delays and the levels-of-service for each lane group and the overall intersection.

The results of the Level-of-Service analysis for unsignalized intersections are also shown in Table 5. The average control delays and levels-of-service are shown for controlled movements only. Volume-to-capacity ratios are not shown for unsignalized intersections. Overall intersection volume-to-capacity ratios, delays and levels-of-service are not calculated for unsignalized intersections.

Table 5 Existing (2004) Levels-of-Service

Intersection, Approach and Movement	AM Peak Hour			PM Peak Hour		
	V/C	Delay ¹	LOS ²	V/C	Delay	LOS
1. Old Haleakala Highway at Haleakala Highway						
Eastbound Left	0.83	74.6	E	0.72	48.5	D
Eastbound Thru	0.65	69.0	E	0.03	66.6	E
Eastbound Right	1.07	172.2	F	0.53	81.6	F
Westbound Left	0.00	67.8	E	0.02	66.3	E
Westbound Thru	0.84	98.6	F	0.33	72.7	E
Westbound Right	0.35	64.6	E	0.41	71.3	E
Northbound Left & Thru	0.68	101.6	F	0.19	70.4	E
Northbound Right	1.00	65.1	E	0.71	38.2	D
Southbound Left & Thru	0.05	17.8	B	0.00	22.2	C
Southbound Right	0.64	57.7	E	0.71	49.6	D
Southbound Left & Thru	0.00	42.7	D	0.00	32.3	C
2. Haleakala Highway at Makawao Avenue						
Eastbound Left	0.84	157.3	E	0.79	115.0	F
Eastbound Thru & Right	0.03	29.8	C	0.11	44.6	D
Westbound Left	0.61	38.6	D	0.76	56.3	E
Westbound Thru	0.76	61.1	F	2.27	647.1	F
Westbound Right	0.12	23.6	C	0.77	53.1	D
Northbound Left & Thru	0.00	22.2	C	0.06	34.3	C
Northbound Right	1.15	114.3	F	0.63	13.7	B
Southbound Left & Thru	0.33	15.9	B	0.09	6.5	A
Southbound Right	0.46	18.2	B	0.48	10.4	B
Southbound Left & Thru	0.01	12.2	B	0.00	6.0	A
3. Haleakala Highway at Makani Road						
Eastbound Left	10.0	7.6	A	9.5	9.5	A
Eastbound Thru & Right	7.6	7.6	A	9	9	A
Northbound Left & Thru	289.4	10.7	F	>999.9	>999.9	F
Northbound Right	9.1	10.7	A	10.7	10.7	B
Southbound Left & Thru	553.8	491.8	F	491.8	491.8	F
Southbound Right	27.9	10.9	D	10.9	10.9	B
4. Haleakala Highway at Old Haleakala Highway						
Northbound Left	See Note (3)				67.3	F
Northbound Right					17.2	C
5. Haleakala Highway at Hana Highway						
Eastbound Left & Thru	1.07	88.8	F	0.70	58.6	E
Eastbound Right	0.74	135.2	F	0.71	74.1	E
Westbound Left	0.05	85.0	F	0.05	55.1	E
Westbound Thru	1.07	81.0	F	0.67	45.2	D
Westbound Right	0.99	56.3	E	0.65	44.2	D
Northbound Left	0.00	11.5	B	0.00	28.7	C
Northbound Thru	0.85	216.1	F	0.50	117.6	F
Northbound Right	0.90	61.4	E	0.75	67.1	E
Southbound Left	0.33	59.1	E	0.00	49.7	D
Southbound Thru	0.57	136.0	F	0.16	91.9	F
Southbound Right	1.14	146.4	F	0.64	62.7	E
Southbound Left & Thru	0.16	55.3	E	0.04	50.4	D

Table 5 (Continued) Existing (2004) Levels-of-Service

Intersection, Approach and Movement	AM Peak Hour			PM Peak Hour		
	V/C	Delay ¹	LOS ²	V/C	Delay	LOS
6. Old Haleakala Highway at Makawao Avenue and Lohia Street	0.63	17.2	B	0.60	15.3	B
Eastbound Left & Thru	0.37	9.1	A	0.48	7.7	A
Eastbound Right	0.43	8.4	A	0.24	4.4	A
Westbound Left, Thru & Right	0.52	17.8	B	0.46	15.4	B
Northbound Left, Thru & Right	0.63	31.8	C	0.36	30.4	C
Southbound Left & Thru	0.35	26.3	C	0.54	36.0	D
Southbound Right	0.31	24.7	C	0.28	29.4	C
7. Old Haleakala Highway at Puukalani Street	0.92	35.2	D	0.73	16.6	B
Eastbound Thru	0.77	31.4	C	0.61	26.6	C
Eastbound Right	0.09	3.0	A	0.87	13.3	B
Westbound Left	0.84	33.4	C	0.64	13.5	B
Westbound Thru	0.31	10.0+	B	0.19	5.4	A
Northbound Left	1.02	65.8	E	0.64	34.9	C
Northbound Right	0.19	7.4	A	0.33	8.5	A
8. Old Haleakala Highway at Makani Road						
Eastbound Left	10.7		B		8.6	A
Southbound Left	140.8		F		125.4	F
Southbound Right	16.8		C		11.1	B
9. Kula Highway at King Kekaulike High School Entrance						
Eastbound Left	14.0		B		9.2	A
Westbound Left & Thru	9.3		A		8.8	A
Northbound Left, Thru & Right	680.0		F		48.9	E
Southbound Left & Thru	547.8		F		62.5	F
Southbound Right	34.9		D		18.2	C
10. Kula Highway at Kamehameha School Entrance						
Westbound Left	10.1		B		9.4	A
Northbound Left	84.7		F		18.0	C
Northbound Right	11.7		B		13.8	B
11. Kula Highway at Thompson Road						
Eastbound Left & Thru	7.5		A		7.5	A
Southbound Left & Right	8.8		A		9.4	A
12. Kula Highway at Lau'ia Drive						
Westbound Left & Thru	7.5		A		7.8	A
Northbound Left & Right	9.3		A		12.8	B

NOTES:
(1) Delay in seconds per vehicle.
(2) LOS denotes Level-of-Service calculated using the operations method described in Highway Capacity Manual. Level-of-Service is based on delay.
(3) Delay calculations for the AM peak hour could not be calculated as all movements are free-flowing except the northbound to eastbound right turn, which is a negligible number of vehicles during the AM peak hour.

The conclusions of the Level-of-Service analysis are:

- Haleakala Highway at Old Haleakala Highway and Kula Highway**
This intersection operates a Level-of-Service E during the morning peak hour. All traffic movements operate at Level-of-Service E or F except the northbound right and the southbound right, which operate at Level-of-Service B and D, respectively. The counts were performed during the peak commute hour and included traffic associated with King Kekaulike High School, Kamehameha School and the morning commuter traffic. The calculated levels-of-service are consistent with conditions observed during the traffic counts.
During the afternoon peak hour, the overall intersection operates at Level-of-Service D. Only the northbound and southbound approaches operate at acceptable Level-of-Service C or D. All the remaining movements operate at Level-of-Service E or F.
- Haleakala Highway at Makawao Avenue**
During the morning peak hour, the overall intersection operates at Level-of-Service E. However, only the westbound left and the northbound left & through operate at Level-of-Service F. All the remaining movements operate at Level-of-Service D, or better.
During the afternoon peak hour, the overall intersection operates at Level-of-Service F. Only the eastbound through and right operates at Level-of-Service E and the westbound left operates at Level-of-Service F. The remaining movements operate at Level-of-Service D, or better.
- Haleakala Highway at Makani Road**
Traffic from the side streets operate a Level-of-Service F during both peak periods. The Maui Long Range Transportation Plan recommended that this intersection be signalized, which would mitigate this deficiency. We were informed during the review of the traffic study for Kulamalu, that signalization of this intersection is a priority. We have not been able to determine when the traffic signals will be installed.
- Haleakala Highway at Old Haleakala Highway**
During the morning peak hour, eastbound through movement is prohibited. All eastbound traffic must turn right onto Old Haleakala Highway. The northbound to westbound left turn is a free right turn onto Haleakala Highway. The result is that during the morning peak hour all movements are free flow and the Level-of-Service is A.
During the afternoon peak hour, the northbound to westbound left turn must use the STOP sign with a resulting delay that results in Level-of-Service F. The provision of an acceleration and merge lane for these left turns mitigates some of the delay.
- Haleakala Highway at Hana Highway**
This intersection operates at Level-of-Service F during the morning and Level-of-Service E during the afternoon peak hour. During the morning peak hour, all movements except the westbound right operate at Level-of-Service E or F.

During the afternoon peak hour, the westbound approach, the northbound right and the southbound right turns operate at Level-of-SERVICE D. All the remaining movements operate at Level-of-SERVICE E or F.

6. Old Haleakala Highway at Makawao Avenue and Loha Street

The overall intersection operates at Level-of-SERVICE B during both peak periods. All movements operate at Level-of-SERVICE C, or better, with the exception of the southbound left and through movement which operates at Level-of-SERVICE D during the afternoon peak hour.

7. Old Haleakala Highway at Pukalani Street

This intersection operates at Level-of-SERVICE D during the morning peak hour and Level-of-SERVICE B during the afternoon peak hour. During the morning peak hour, all movements operate at Level-of-SERVICE C, or better, except the northbound left, which operates at Level-of-SERVICE E. During the afternoon peak hour, all movements operate at Level-of-SERVICE C, or better.

8. Old Haleakala Highway at Makani Road

The southbound left turn operates at Level-of-SERVICE F during both peak periods. The remaining movements operate at Level-of-SERVICE C, or better.

9. Kula Highway at King Kekaulike High School Entrance

During the morning peak hour, the intersection is congested as a result of morning school traffic. This is confirmed as the northbound and southbound approaches operate at Level-of-SERVICE F. The eastbound left turn into King Kekaulike Highway operates at Level-of-SERVICE B. It should be noted that even though the level-of-service is high (Level-of-SERVICE B), the queues are long and the area is generally congested for a short period during the morning peak hour because of traffic associated with the schools in the area and the typical weekday commuter traffic.

During the afternoon peak hour, the northbound and southbound approaches operate at Level-of-SERVICE E and F. The remaining movements operate at Level-of-SERVICE C, or better. Signalization of this intersection has been discussed at several meetings. However, funding has never become available and the issue of what agency is responsible for funding the signals has not been resolved.

10. Kula Highway at Kamehameha School Entrance

The northbound to westbound left turns from the Kamehameha School entrance operates at Level-of-SERVICE F during the morning peak hour. Traffic signals are being designed for this intersection and will be installed upon approval of the plans by the State of Hawaii Department of Transportation.

11. Kula Highway at Thompson Road

All movements at this intersection operate at Level-of-SERVICE A during both peak hours.

12. Kula Highway at Lau'ie Drive

All movements operate at Level-of-SERVICE A or B.

3. BACKGROUND TRAFFIC CONDITIONS

The purpose of this chapter is to discuss the assumptions and data used to estimate 2010 background traffic conditions. Background traffic conditions are defined as future traffic volumes without the proposed project.

Future traffic growth consists of two components. The first is ambient background growth that is a result of regional growth and cannot be attributed to a specific project. The second component is estimated traffic that will be generated by other development projects in the vicinity of the proposed project.

Background Traffic Growth

The Maui Long Range Transportation Plan² concluded that traffic in Maui would increase an average of 1.6% per year from 1990 to 2020. This growth rate was used to estimate the background growth between 2004 and 2010, which is the design year for this project. The growth factor was calculated to be 1.10 using the following formula:

$$F = (1 + i)^n$$

where F = Growth Factor

i = Average annual growth rate, or 0.016

n = Growth period, or 6 years

This growth factor was applied to all traffic movements at the study intersections.

² Kaku Associates, Maui Long Range Land Transportation Plan, October 1996

Related Projects

The second component in estimating background traffic volumes is traffic resulting from other proposed projects in the vicinity. Related projects are defined as those projects that are under construction, have been approved for construction or have been the subject of a traffic study and would significantly impact traffic in the study area. Related projects may be development projects or roadway improvements.

It was determined that there are three projects in the Pukalani area that will generate additional traffic within the study area. The locations of these projects are shown on Figure 7. The traffic characteristics of these projects are summarized in Table 6.

Table 6 Trip Generation Summary of the Related Projects

Related Project	AM Peak Hour			PM Peak Hour		
	Total	In	Out	Total	In	Out
Upcountry Town Center ⁽¹⁾	486	320	163	1017	444	573
Kamehameha School (Additional Grades) and Kulamalu ⁽²⁾	852	524	328	736	378	358
Kauhale Lani ⁽³⁾	137	32	95	168	108	60
TOTAL	1338	844	491	1753	822	931

Notes:
 (1) Parsons Brinckerhoff Quade & Douglas, *Traffic Impact Assessment Study Upcountry Town Center*, March 2002
 (2) Phillip Rowell and Associates, *Traffic Impact Study for Kamehameha School, Maui Campus*, August 15, 2002
 (3) Phillip Rowell and Associates, *Traffic Impact Analysis Report for the Kauhale Lani Community*, May 2005

The first is the proposed Upcountry Town Center, which will be in the triangle bordered by Old Haleakala Highway, Makawao Avenue and Haleakala Highway. The traffic study for this project was obtained and reviewed. The traffic study for the Upcountry Town Center³ recommended the following roadway improvements at the study intersections:

- Exclusive right turn lanes from Haleakala Highway at Makawao Avenue.
- Exclusive right turn lane along the southbound approach of Makawao Avenue at Haleakala Highway.
- Exclusive left turn signal phase for Makawao Avenue movements at Haleakala Highway.

The traffic study analyzed three intersections adjacent to the Upcountry Town Center (Haleakala Highway at Makawao Avenue, Old Haleakala Highway at Makawao Avenue and Old Haleakala Highway at Kula Highway). The traffic generated by the Upcountry Town Center was assigned to the other intersections within the study area and added to the background traffic previously estimated.

18. ³ Parsons Brinckerhoff Quade & Douglas, *Traffic Impact Assessment Study*, Upcountry Town Center, March 2002, page

The second project is the expansion of Kamehameha School and includes Kulamalu and other development associated with the Kulamalu Development. The traffic study for this project was also obtained and the traffic assignments used to develop the traffic forecasts. It should be noted that the traffic assignments include traffic generated by grades 7 through 12, some of which have been added since the traffic study was completed. Therefore, the traffic for the grades added since has been double counted as it is included in the existing counts and forecasts.

The installation of traffic signals at the intersection of Kula Highway at the Kamehameha School Entrance is associated with this project.

In the Kula and Waiohuli areas, the following projects were identified:

1. Kula Residence Lots, Unit 1 Subdivision, 219 remaining lots⁴
2. Hawaiian Home Lands Subdivisions at Waiohuli⁵
3. Keokea Agricultural Lots⁶

Forecasts associated with these three projects were obtained directly from the traffic study for the Hawaiian Home Lands Subdivision at Waiohuli.

During review of the traffic study for Kamehameha Schools, it was learned that State of Hawaii Department of Transportation plans to signalize the intersection of Haleakala Highway at Makani Road. A scheduled completion date was not provided, but it was assumed that construction would be completed within the design year of the project (2010).

2010 Background Traffic Projections

2010 background traffic projections were calculated by expanding existing traffic volumes by the appropriate growth rates and then superimposing traffic generated by the related project. The resulting 2010 background weekday morning and afternoon peak hourly traffic volumes are shown in Figures 8 and 9, respectively.

⁴ Austin, Tsutsumi & Associates, Inc., *Traffic Impact Study for Hawaiian Home Lands Subdivisions at Waiohuli (Waiohuli Hikina, Waiohuli Uka and Waiohuli Lot 134)*, February 17, 2004

⁵ Ibid

⁶ Phillip Rowell and Associates, *Traffic Analysis Report DHHL Keokea Agricultural Lots*, June 11, 2002

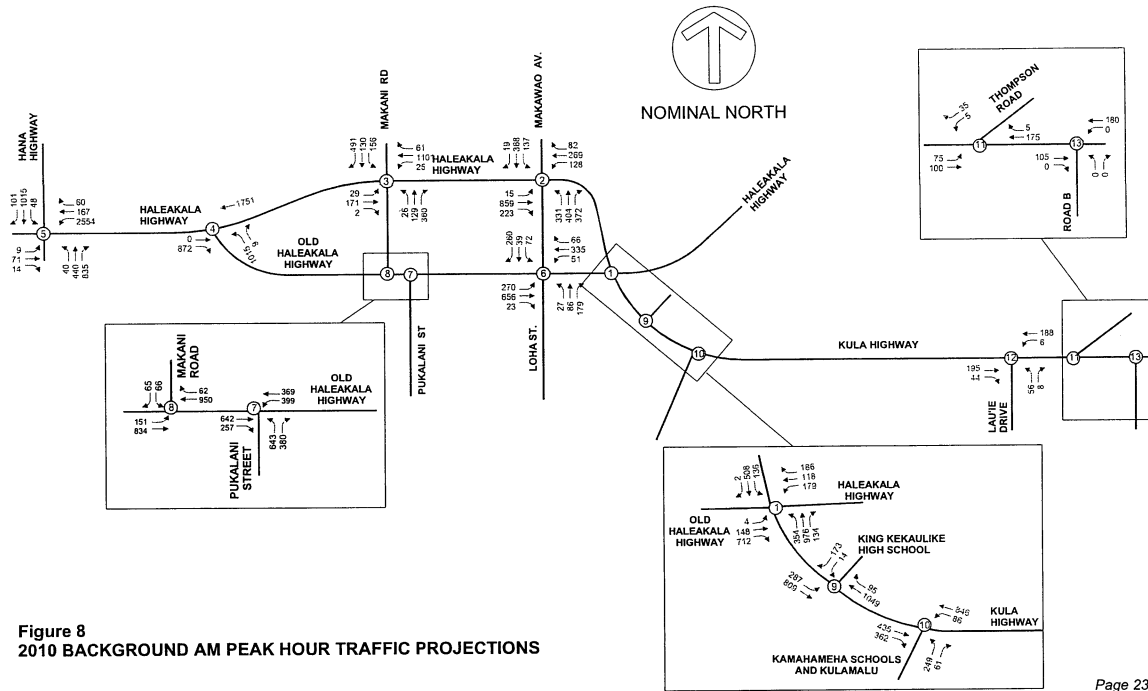


Figure 8
2010 BACKGROUND AM PEAK HOUR TRAFFIC PROJECTIONS

Phillip Rowell and Associates

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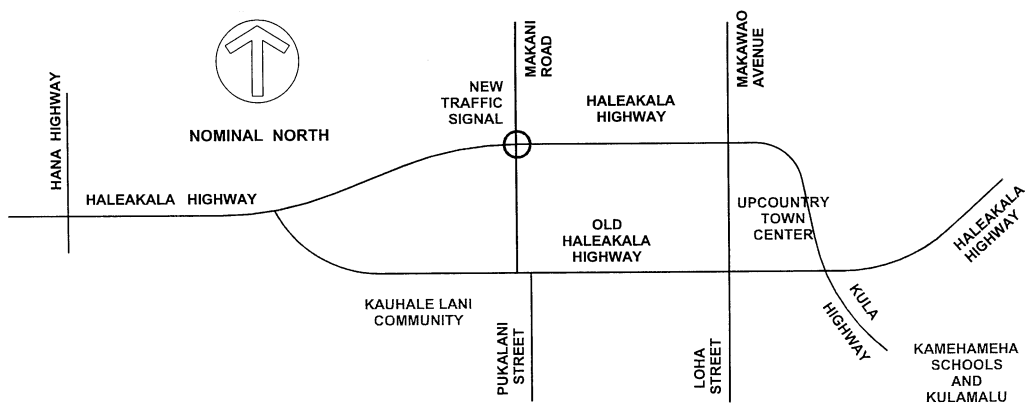


Figure 7
LOCATIONS OF RELATED PROJECTS

Phillip Rowell and Associates

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4. PROJECT-RELATED TRAFFIC CHARACTERISTICS

This chapter discusses the methodology used to identify the traffic-related characteristics of the proposed project. Generally, the process involves the determination of peak-hour trips that would be generated by the proposed project, distribution and assignment of these trips on the approach and departure routes, and finally, determination of the levels-of-service at affected intersections and driveways subsequent to implementation of the project. This chapter presents the generation, distribution and assignment of project generated traffic and the background plus project traffic projections. The results of the Level-of-Service analysis of background plus project conditions is presented in the following chapter.

Project Trip Generation

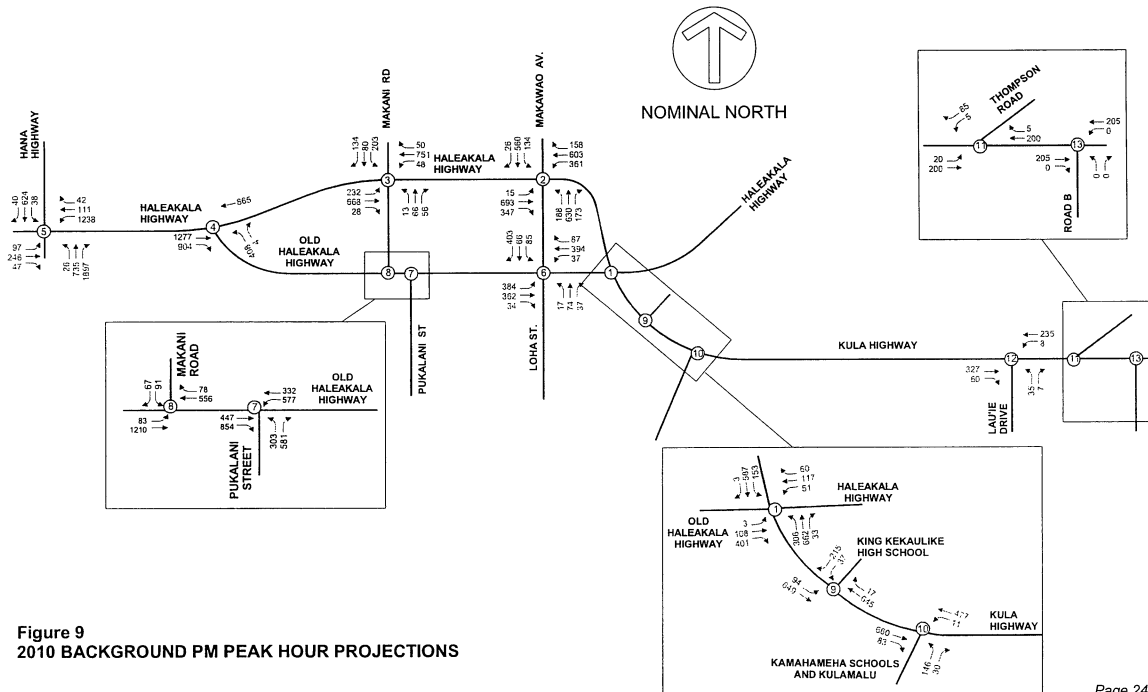
Future traffic volumes generated by the project were estimated using the procedures described in the *Trip Generation Handbook*⁷ and data provided in *Trip Generation*⁸. This method used trip generation rates to estimate the number of trips that the project will generate during the peak hours of the project and along the adjacent street.

The project will consist of 337 single-family residential lots. Single-family detached housing is defined by the Institute of Transportation Engineers as follows:

⁷ Institute of Transportation Engineers, *Trip Generation Handbook*, Washington, D.C., 1998, p. 7-12

⁸ Institute of Transportation Engineers, *Trip Generation*, Washington, D.C., 2003

Phillip Rowell and Associates



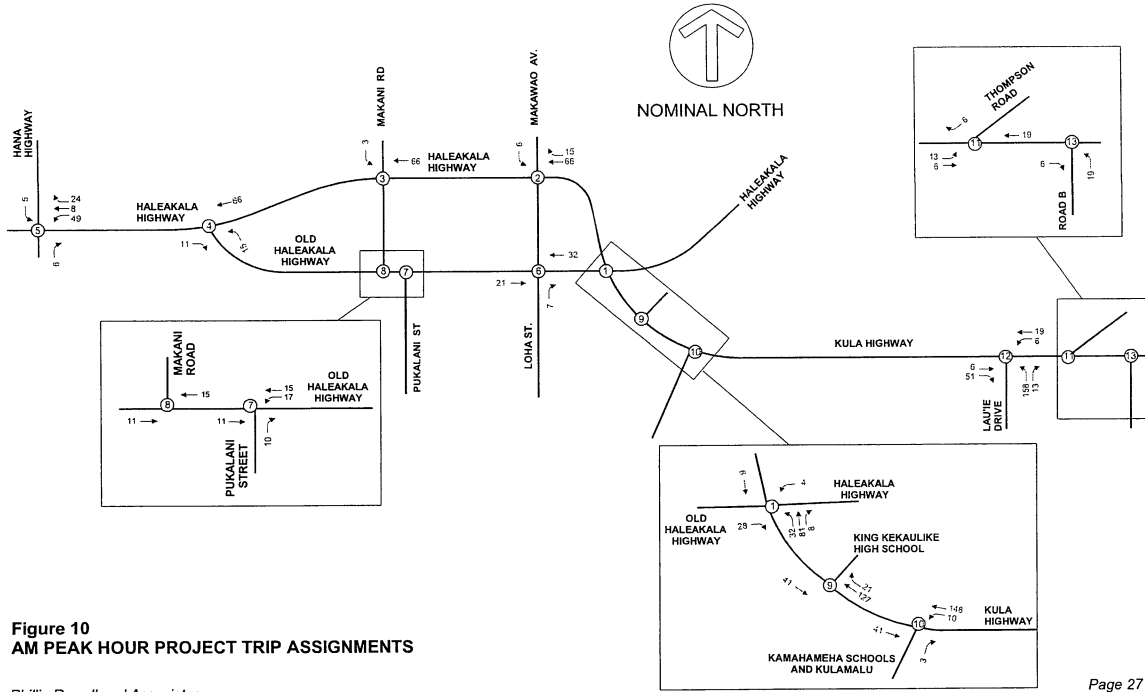


Figure 10
AM PEAK HOUR PROJECT TRIP ASSIGNMENTS

Phillip Rowell and Associates

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Traffic Impact Analysis Report for Waiohuli Homestead Community

Single-family detached housing includes all single-family detached homes on individual lots. A typical site surveyed is a suburban subdivision.⁹

The trip generation analysis is summarized in Table 7.

Table 7	Trip Generation Analysis	Single-Family Residential Lots		
		Trips per Unit	Units	Trips
AM Peak Hour	Total	0.75	337	253
	Inbound	25%		63
	Outbound	75%		190
PM Peak Hour	Total	1.01		340
	Inbound	63%		214
	Outbound	37%		126

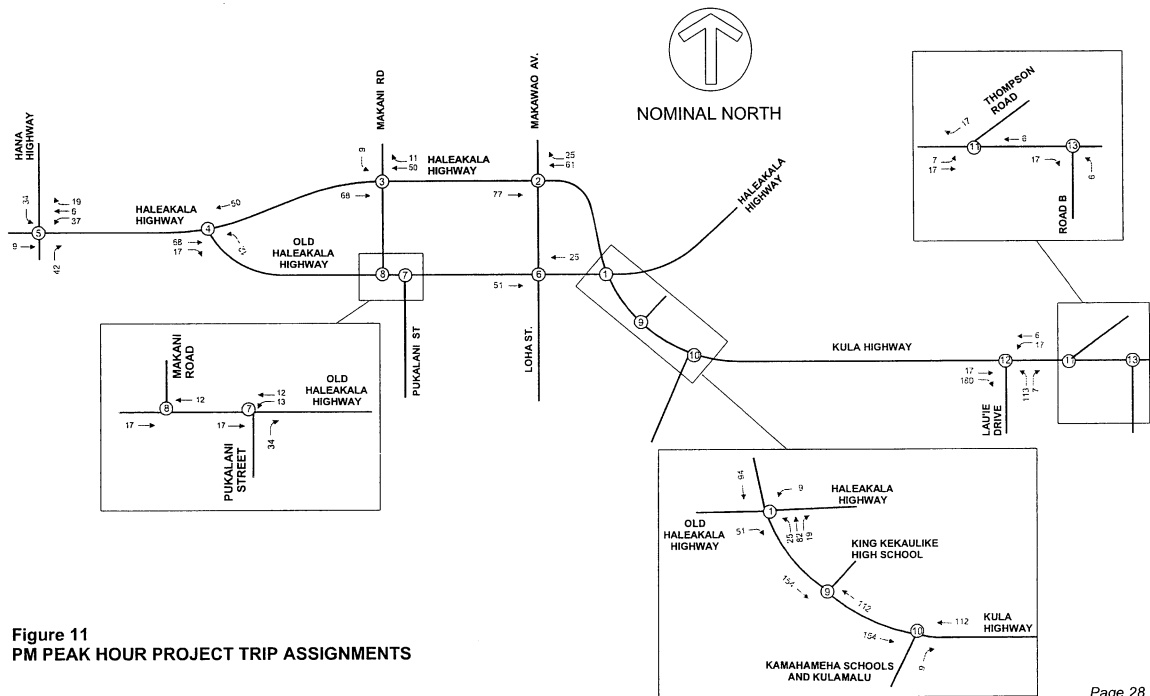
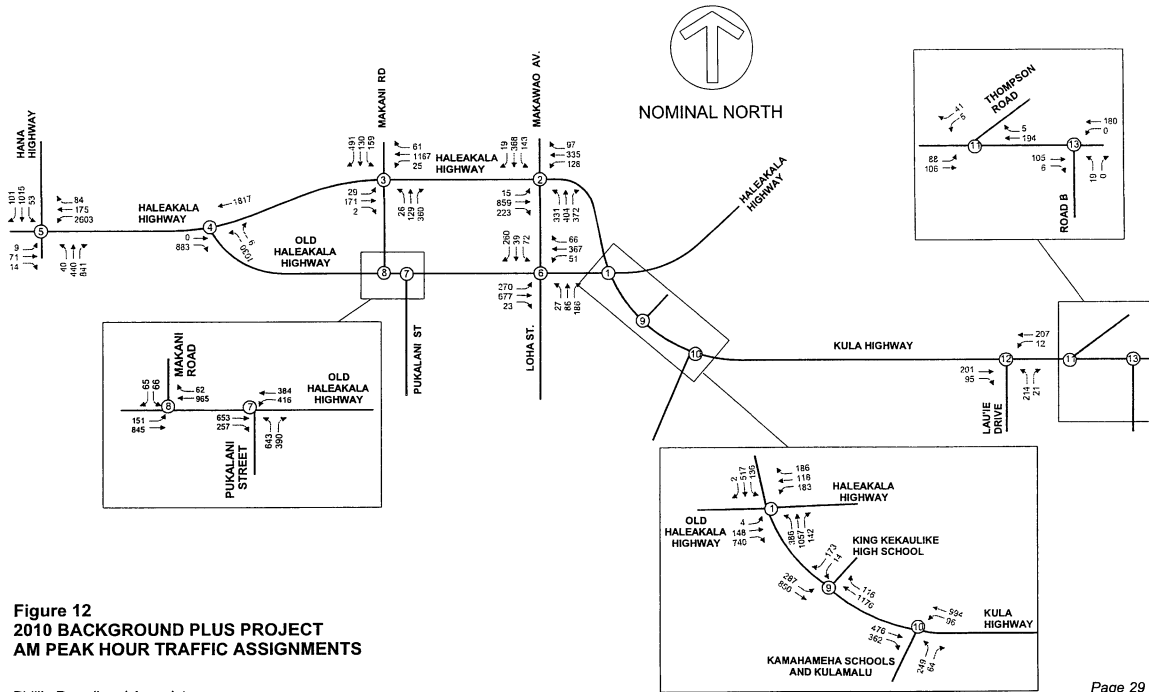
As shown the proposed project will generate 63 inbound and 190 outbound trips during the morning peak hour. During the afternoon peak hour, the project will generate 214 inbound and 126 outbound trips.

2010 Background Plus Project Projections

Background plus project traffic conditions are defined as 2010 background traffic conditions plus project generated traffic. The project generated traffic was distributed and assigned based on the existing approach and departure pattern of traffic along the pertinent sections of Kula, Haleakala and Old Haleakala Highways. The morning and afternoon peak hour traffic assignments are shown in Figures 10 and 11, respectively.

2010 background plus project traffic projections were estimated by superimposing the peak hourly traffic generated by the proposed project on the 2010 background (without project) peak hour traffic projections. This assumes that the peak hourly trips generated by the project coincide with the peak hour of the adjacent street. This represents a worse-case condition. The resulting 2010 background plus project peak hour traffic projections are shown in Figures 12 and 13, respectively.

⁹ Institute of Transportation Engineers, *Trip Generation*, Washington, D.C., 1997, p. 262



5. TRAFFIC IMPACT ANALYSIS

The purpose of this chapter is to summarize the results of the Level-of-Service analysis of future conditions with traffic generated by the proposed project. This analysis identifies any potential traffic operational deficiencies. If deficiencies are anticipated, mitigation measures are identified and assessed.

Traffic Impact Analysis

The impact of traffic generated by Waiohuli Homestead Community was analyzed by analyzing the changes in peak hourly traffic volumes at the study intersections and the volume-to-capacity ratios of the overall intersection and each controlled lane group. These analyses are discussed in the following two sections.

Volume Change Analysis

An analysis of the changes in the peak hourly traffic volumes at the study intersections is summarized in Table 8. Shown are the existing (2004), 2010 background and 2010 background plus project peak hour traffic projections. Also shown are the estimated traffic volumes added by background growth, related project traffic and project generated traffic. There is no established criteria for the impact to be considered significant. However, it is generally accepted that an increase of 5%, or more, should trigger assessment of viable mitigation measures.

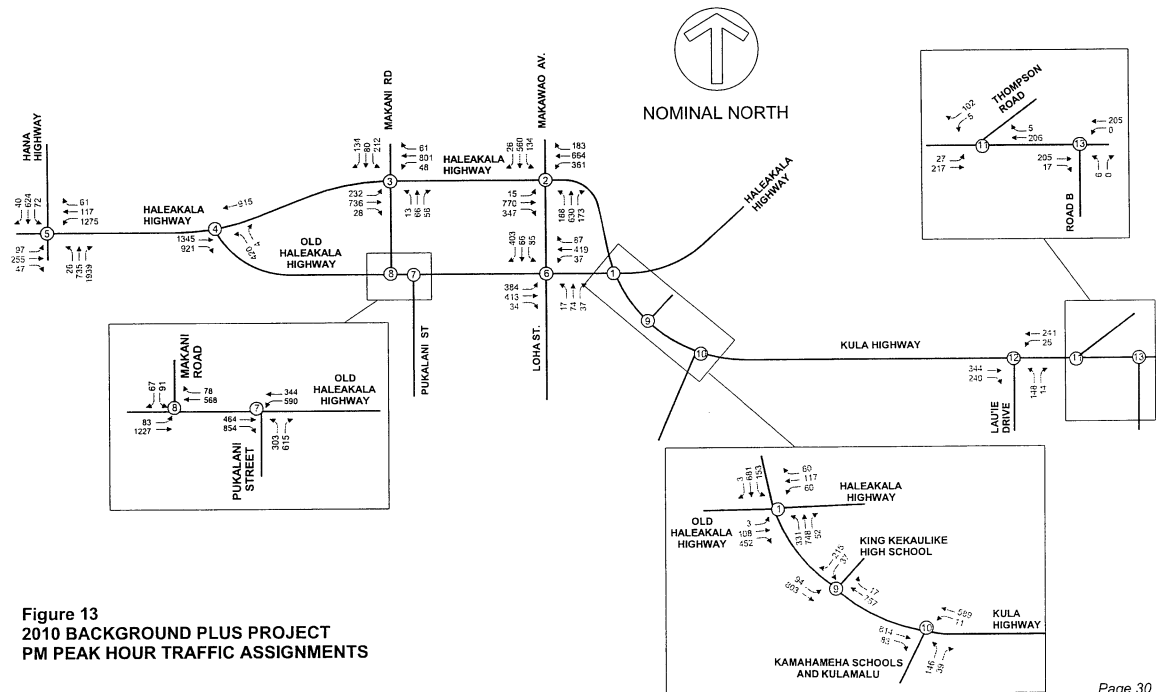


Table 8 Analysis of Traffic Growth at Study Intersections

Intersection and Peak Period	Existing		Background Growth and Related Project Trips		2010 Background Trips		Project Trips		2010 Background Plus Project
	Trips (2004)	%	Trips	%	Trips	%	Trips	%	
1 Haleakala Highway at Kula Highway	2402	43.92%	1055	43.92%	3457	162	4.69%	3619	2768
2 Haleakala Highway at Makawao Avenue	2260	41.90%	947	41.90%	3207	87	2.71%	3294	4051
3 Haleakala Highway at Makani Road	2621	48.34%	1267	48.34%	3888	163	4.19%	4051	2467
4 Haleakala Highway at Old Haleakala Highway	1699	37.08%	630	37.08%	2329	138	5.93%	2467	3739
5 Haleakala Highway at Hana Highway	2625	31.73%	833	31.73%	3458	147	4.25%	3605	5446
6 Old Haleakala Highway at Makawao Avenue & Lohi Street	4351	23.05%	1003	23.05%	5354	92	1.72%	5446	5288
7 Old Haleakala Highway at Pukalani Street	4145	24.03%	986	24.03%	5141	147	2.86%	5288	2124
8 Old Haleakala Highway at Makani Road	1630	26.63%	434	26.63%	2064	60	2.91%	2124	2056
9 Kula Highway at King Kekaulike High School	1508	31.30%	472	31.30%	1980	76	3.84%	2056	2743
10 Kamehameha School & Kulemalo	2184	23.17%	506	23.17%	2690	53	1.97%	2743	2154
11 Kula Highway at Thompson Road	2483	24.81%	611	24.81%	3094	76	2.46%	3170	2114
12 Kula Highway at Lauie Drive	1725	23.35%	403	23.35%	2128	26	1.22%	2154	1940
13 Kula Highway at Drive "B"	1696	22.84%	389	22.84%	2085	29	1.39%	2114	1682
	2212	9.99%	221	9.99%	2433	189	7.77%	2622	2241
	1621	10.08%	163	10.08%	1674	202	9.91%	1876	1555
	1279	10.01%	128	10.01%	1407	275	19.55%	1682	592
	AM	224	171	76.34%	395	44	11.14%	439	750
	PM	256	259	101.17%	515	47	9.13%	562	1012
	AM	271	226	83.39%	497	253	50.91%	750	433
	PM	324	348	107.41%	672	340	50.60%	1012	
	AM	125	160	128.00%	285	25	8.77%	310	
	PM	162	248	153.08%	410	23	5.61%	433	

Notes:

(1) Related projects are other development projects in the vicinity that will generate additional traffic at the study intersections. See Table 6 on page 19 for a list of related projects.

As shown in the table, the increases in peak hour traffic volumes at the intersections along Haleakala Highway are all less than 6%. This implies a minor increase in traffic at these intersections as a result of project generated traffic. However, because the traffic volumes using these intersections are large and the levels-of-service are generally low, mitigation may be considered at locations where the increase is less than 5% standard noted in the previous paragraph.

At the intersections along Old Haleakala Highway, the increases in traffic volumes are naturally a greater percentage because these intersections are closer to the project and generally have lower background traffic volumes. The increases in traffic volumes at these intersections range between 1.22% and 4.25%.

Overall, the increases in peak hourly traffic volumes as a result of project generated traffic are significantly less than the increases as a result of ambient background traffic growth and traffic generated by related projects.

Volume-to-Capacity and Level-of-SERVICE Impact Analysis

The Level-of-SERVICE analysis was performed for 2010 background and 2010 background plus project conditions to identify the impacts of the project and locations where mitigation measures should be investigated. The Level-of-SERVICE analysis calculates the volume-to-capacity ratio of each movement. The change in the volume-to-capacity ratio quantifies the impact of the project. As previously noted in Chapter 2, Level-of-SERVICE D is generally considered an acceptable level-of-service.

The results of the Level-of-SERVICE analysis is presented separately for each of the study intersections.

1. Haleakala Highway at Kula Highway/Old Haleakala Highway

The Level-of-SERVICE analysis of this intersection for existing right-of-way control conditions is summarized in Table 9. Overall, the intersection will operate at Level-of-SERVICE F during both peak periods, without and with project generated traffic.

Table 9 Level-of-SERVICE Analysis - Haleakala Highway at Kula Highway/Old Haleakala Highway

Peak Hour, Approach and Movement	2010 Background			2010 Background Plus Project			Changes	
	V/C ¹	Delay ²	LOS ³	V/C	Delay	LOS	V/C	Delay
AM Peak Hour	1.41	209.2	F	1.44	239.5	F	0.03	30.3
Eastbound Left	0.05	69.1	E	0.05	69.1	E	0.00	0.0
Eastbound Thru	1.27	242.4	F	1.27	242.4	F	0.00	0.0
Eastbound Right	0.63	95.8	F	0.91	139.2	F	0.28	43.4
Westbound Left	1.06	150.6	F	1.09	159.3	F	0.03	8.7
Westbound Thru	0.48	68.3	E	0.48	68.3	E	0.00	0.0
Westbound Right	0.88	131.0	F	0.88	131.0	F	0.00	0.0
Northbound Left & Thru	1.41	227.6	F	1.53	280.7	F	0.12	53.1
Northbound Right	0.09	18.2	B	0.09	18.3	B	0.00	0.1
Southbound Left & Thru	1.40	248.8	F	1.42	256.8	F	0.02	8.0
Southbound Right	0.00	42.7	D	0.00	42.7	D	0.00	0.0
PM Peak Hour	1.21	135.2	F	1.37	195.3	F	0.16	61.1
Eastbound Left	0.04	67.0	E	0.04	67.0	E	0.00	0.0
Eastbound Thru	0.78	102.3	F	0.78	102.3	F	0.00	0.0
Eastbound Right	1.27	242.2	F	1.70	420.0	F	0.43	177.8
Westbound Left	0.56	86.5	F	0.66	96.1	F	0.10	9.6
Westbound Thru	0.63	80.9	F	0.63	80.9	F	0.00	0.0
Westbound Right	0.26	72.2	E	0.26	72.2	E	0.00	0.0
Northbound Left & Thru	1.17	131.3	F	1.31	187.6	F	0.14	56.3
Northbound Right	0.03	22.5	C	0.05	22.9	C	0.02	0.4
Southbound Left & Thru	1.17	141.1	F	1.31	202.0	F	0.14	60.9
Southbound Right	0.00	32.3	C	0.00	32.3	C	0.00	0.0

NOTES:

1. Peak hour conditions analyzed are "worst-case" conditions, which is the sum of the peak hour of the adjacent street plus the peak hour of the generator.
2. V/C denotes ratio of volume to capacity. V/C ratio is not calculated for unsaturated intersections.
3. Delay is in seconds per vehicle.
4. LOS denotes Level-of-SERVICE calculated using the operations method described in Highway Capacity Manual. LOS is based on delay.

During the morning peak hour, all movements will operate at Level-of-SERVICE E or F, except the northbound right turn, which will operate at Level-of-SERVICE B and the southbound right which will operate at Level-of-SERVICE D. There is no change as a result of project generated traffic as the proposed project adds no traffic to these movements. During then afternoon peak hour, all movements will operate at Level-of-SERVICE E or F, except the northbound and southbound right turns, which will operate at Level-of-SERVICE C without and with the project. These low levels-of-service are the result of regional traffic. This is an indication that the

low levels-of-service at this intersection is a regional issue that must be addressed on a regional basis. Improvements as identified in the *Maui Long-Range Land Transportation Plan* should be implemented. The applicant should be responsible for no more than the project's pro rata share of the total traffic using the intersection.

2. Haleakala Highway at Makawao Avenue

The results of the Level-of-Service analysis for the intersection of Haleakala Highway at Makawao Avenue are summarized in Table 10. Overall the intersection will operate at Level-of-Service F during both peak periods, without and with the project. As with the previous intersection, the low levels-of-service are the result of regional traffic growth and traffic generated by other development projects, specifically the Upcountry Town Center for this particular intersection. Less than 5% of the peak hourly traffic volumes are project generated traffic. This is a clear indication that the low levels-of-service at this intersection is a regional issue that must be addressed on a regional basis. Improvements as identified in the *Maui Long-Range Land Transportation Plan* should be implemented. The applicant should be responsible for no more than the project's pro rata share of the total traffic using the intersection.

Table 10 Level-of-Service Analysis - Haleakala Highway at Makawao Avenue

Peak Hour, Approach and Movement AM Peak Hour	2010 Background				2010 Background Plus Project				Changes	
	V/C ⁽¹⁾	Delay ⁽²⁾	LOS ⁽³⁾	F	V/C	Delay	LOS	F	V/C	Delay
Eastbound Left	0.05	30.1	C	0.06	30.3	C	0.010	0.2	0.000	0.0
Eastbound Thru & Right	1.00	70.7	E	1.00	70.7	E	0.000	0.0	0.000	0.0
Westbound Left	0.84	91.6	F	0.84	91.6	F	0.000	0.0	0.000	0.0
Westbound Thru	0.39	27.8	C	0.49	29.8	C	0.100	2.0	0.000	0.0
Westbound Right	0.07	23.1	C	0.10	23.4	C	0.030	0.3	0.000	0.0
Northbound Left & Thru	1.65	327.5	F	1.66	333.6	F	0.010	6.1	0.000	0.0
Northbound Right	0.38	16.5	B	0.38	16.5	B	0.000	0.0	0.000	0.0
Southbound Left & Thru	1.13	108.4	F	1.17	123.4	F	0.040	15.0	0.000	0.0
Southbound Right	0.01	12.2	B	0.01	12.2	B	0.000	0.0	0.000	0.0
PM Peak Hour	1.28	212.2	F	1.31	237.9	F	0.030	25.7	0.000	0.0
Eastbound Left	0.24	51.6	D	0.24	51.8	D	0.000	0.0	0.000	0.0
Eastbound Thru & Right	1.61	332.0	F	1.74	388.4	F	0.130	56.4	0.000	0.0
Westbound Left	2.50	748.6	F	2.50	748.6	F	0.000	0.0	0.000	0.0
Westbound Thru	1.28	184.9	F	1.41	240.0	F	0.130	55.1	0.000	0.0
Westbound Right	0.21	36.5	D	0.27	37.5	D	0.060	1.0	0.000	0.0
Northbound Left & Thru	1.06	66.4	E	1.06	66.4	E	0.000	0.0	0.000	0.0
Northbound Right	0.10	6.6	A	0.10	6.6	A	0.000	0.0	0.000	0.0
Southbound Left & Thru	0.86	26.0	C	0.86	26.0	C	0.000	0.0	0.000	0.0
Southbound Right	0.01	6.0	A	0.01	6.0	A	0.000	0.0	0.000	0.0

NOTES:
1. Peak hour conditions analyzed are "worst-case" conditions, which is the sum of the peak hour of the adjacent street plus the peak hour of the generator.
2. V/C denotes ratio of volume to capacity. V/C ratio is not calculated for unsignalized intersections.
3. Delay is in seconds per vehicle.
4. LOS denotes Level-of-Service calculated using the operations method described in *Highway Capacity Manual*. LOS is based on delay.

3. Haleakala Highway at Makani Road

The results of the Level-of-Service analysis for the intersection of Haleakala Highway at Makani Road is summarized in Table 11. As it is anticipated that the intersection will be signalized before 2010, as discussed in Chapter 3, the methodology for signalized intersection was used to analyze this intersection. Overall, the intersection will operate at Level-of-Service D, or better, during both peak periods, without and with the proposed project.

During the morning peak hour, the eastbound left turn and the westbound left turn will operate at Level-of-Service E as defined by delay. However, the volume-to-capacity ratios imply Level-of-Service A or B. This situation implies that the poor level-of-service is a function of the traffic signal timing, rather than insufficient intersection capacity, as these vehicles must wait for the traffic signal to cycle through the other phases before receiving a green light. All the remaining traffic movements will operate at Level-of-Service D, or better, without and with project generated traffic.

During the afternoon peak hour, all traffic movements will operate at Level-of-Service D, or better, without and with project generated traffic.

Table 11 Level-of-Service Analysis - Haleakala Highway at Makani Road

Peak Hour, Approach and Movement AM Peak Hour	2010 Background				2010 Background Plus Project				Changes	
	V/C ⁽¹⁾	Delay ⁽²⁾	LOS ⁽³⁾	C	V/C	Delay	LOS	C	V/C	Delay
Eastbound Left	0.23	56.2	E	0.23	56.2	E	0.000	0.0	0.000	0.0
Eastbound Thru & Right	0.11	17.5	B	0.11	17.5	B	0.000	0.0	0.000	0.0
Westbound Left	0.20	55.4	E	0.20	55.4	E	0.000	0.0	0.000	0.0
Westbound Thru	0.68	26.7	C	0.72	27.9	C	0.040	1.2	0.000	0.0
Westbound Right	0.04	17.0	B	0.04	17.0	B	0.000	0.0	0.000	0.0
Northbound Left & Thru	0.24	25.4	C	0.24	25.4	C	0.000	0.0	0.000	0.0
Northbound Right	0.56	32.1	C	0.56	32.1	C	0.000	0.0	0.000	0.0
Southbound Left & Thru	0.64	36.3	D	0.65	36.8	D	0.010	0.5	0.000	0.0
Southbound Right	0.78	41.4	D	0.78	41.4	D	0.000	0.0	0.000	0.0
PM Peak Hour	0.61	34.5	C	0.61	35.1	C	0.030	0.6	0.000	0.0
Eastbound Left	0.61	48.4	D	0.61	48.4	D	0.000	0.0	0.000	0.0
Eastbound Thru & Right	0.54	31.0	C	0.59	32.1	C	0.050	1.1	0.000	0.0
Westbound Left	0.13	37.7	D	0.13	37.7	D	0.000	0.0	0.000	0.0
Westbound Thru	0.59	32.0	C	0.63	32.9	C	0.040	0.9	0.000	0.0
Westbound Right	0.04	24.0	C	0.06	24.2	C	0.020	0.2	0.000	0.0
Northbound Left & Thru	0.14	27.8	C	0.14	27.8	C	0.000	0.0	0.000	0.0
Northbound Right	0.05	26.6	C	0.05	26.6	C	0.000	0.0	0.000	0.0
Southbound Left & Thru	0.69	42.6	D	0.71	44.1	D	0.020	1.5	0.000	0.0
Southbound Right	0.13	27.7	C	0.13	27.7	C	0.000	0.0	0.000	0.0

NOTES:
1. Peak hour conditions analyzed are "worst-case" conditions, which is the sum of the peak hour of the adjacent street plus the peak hour of the generator.
2. V/C denotes ratio of volume to capacity. V/C ratio is not calculated for unsignalized intersections.
3. Delay is in seconds per vehicle.
4. LOS denotes Level-of-Service calculated using the operations method described in *Highway Capacity Manual*. LOS is based on delay.

4. Haleakala Highway at Old Haleakala Highway

The results of the Level-of-Service analysis for the intersection of Haleakala Highway at Old Haleakala Highway are summarized in Table 12. As discussed in Chapter 2 - Existing Conditions, all movements are free flowing during the morning peak hour and, therefore, operate at Level-of-Service A. A look at morning peak hourly traffic volume along Haleakala Highway shows that there is no increase in the peak hourly traffic volumes as a result of project generated traffic. However, the volume is approximately 1750 vehicles per hour. The maximum theoretical capacity of a free flowing traffic lane, with no adjustments for lane width, heavy vehicles, shoulders, gradient, etc., is 2000 vehicles per hour. This implies a volume-to-capacity ratio of 0.875, or Level-of-Service D, for the westbound through lane and very few gaps in the traffic stream. The proposed project adds no traffic to this movement, but does add traffic to the northbound left turn.

During the afternoon peak hour, the northbound left will operate at Level-of-Service E without the project and Level-of-Service F with the project. The increased delay is the result of the increased eastbound through traffic and therefore fewer acceptable gaps for the northbound to westbound left turns.

A preliminary review of the peak hour warrants for traffic signals indicates that the minimum peak hour volumes will satisfy the warrants for traffic signals during both peak hours. This issue should be discussed with State of Hawaii Department of Transportation.

Table 12 Level-of-Service Analysis - Haleakala Highway at Old Haleakala Highway

Peak Hour, Approach and Movement	2010 Background Delay ^{a)}	2010 Background Plus Project Delay	Changes
AM Peak Hour			
Northbound Left	See Report	See Report	
PM Peak Hour			
Northbound Left	372.2	456.1	83.9

NOTES:
 1. Peak hour conditions analyzed are "worst-case" conditions, which is the sum of the peak hour of the adjacent street plus the peak hour of the generator.
 2. V/C ratio is not calculated for unsignalized intersections.
 3. Delay is in seconds per vehicle.
 4. LOS denotes Level-of-Service calculated using the operations method described in Highway Capacity Manual. LOS is based on delay.

5. Haleakala Highway at Hana Highway

The results of the Level-of-Service analysis for the intersection of Hana Highway at Haleakala Highway are summarized in Table 13. Overall, the intersection will operate at Level-of-Service F during the morning peak hour and Level-of-Service E during the afternoon peak hour, without and with the project.

Table 13 Level-of-Service Analysis - Haleakala Highway at Hana Highway

Peak Hour, Approach and Movement	2010 Background V/C ^{a)}	2010 Background Delay ^{a)}	2010 Background Plus Project V/C	2010 Background Plus Project Delay	Changes
AM Peak Hour					
Eastbound Left & Thru	1.27	155.7	F	162.3	F
Eastbound Right	1.18	248.0	F	248.0	F
Westbound Left	0.06	85.5	F	85.5	F
Westbound Left & Thru	1.29	168.4	F	179.3	F
Westbound Right	1.20	129.6	F	140.8	F
Northbound Left	0.02	11.7	B	11.9	B
Northbound Right	1.08	253.6	F	253.6	F
Southbound Left	0.54	62.6	E	62.6	E
Southbound Right	1.20	182.2	F	188.4	F
Southbound Thru	1.27	322.3	F	369.2	F
Southbound Left	1.26	193.4	F	193.4	F
Southbound Right	0.26	57.6	E	57.6	E
PM Peak Hour					
Eastbound Left & Thru	0.92	73.4	E	84.2	F
Eastbound Right	0.86	86.7	F	89.5	F
Westbound Left	0.06	55.3	E	55.3	E
Westbound Left & Thru	0.91	63.3	E	67.4	E
Westbound Right	0.88	59.5	E	63.5	E
Northbound Left	0.02	29.0	C	29.4	C
Northbound Right	0.54	122.1	F	122.1	F
Southbound Left	0.83	71.5	E	71.5	E
Southbound Right	1.00	111.0	F	142.1	F
Southbound Thru	0.80	164.2	F	392.0	F
Southbound Left	0.70	65.0	E	65.0	E
Southbound Right	0.05	50.5	D	50.5	D

NOTES:
 1. Peak hour conditions analyzed are "worst-case" conditions, which is the sum of the peak hour of the adjacent street plus the peak hour of the generator.
 2. V/C ratio is not calculated for unsignalized intersections.
 3. Delay is in seconds per vehicle.
 4. LOS denotes Level-of-Service calculated using the operations method described in Highway Capacity Manual. LOS is based on delay.

During the morning peak hour, all movements will operate at Level-of-Service E or F, except the westbound right turn, which is the right turn from Haleakala Highway toward Paia. During the afternoon peak hour, all movements will operate at level-of-service E or F, except the westbound right turn and the southbound right turn. These low levels-of-service are the result of regional traffic. Less than 3% of the peak hourly traffic volumes are project generated traffic. This is a clear indication that the low levels-of-service at this intersection is a regional issue that must be addressed on a regional basis. Improvements as identified in the Maui Long-Range Land Transportation Plan should be implemented. The applicant should be responsible for no more than the project's pro rata share of the total traffic using the intersection.

6. Old Haleakala Highway at Makawao Avenue/Loha Street

The results of the Level-of-Service analysis of the intersection of Old Haleakala Highway at Makawao Avenue is tabulated in Table 14. During the morning peak hour, all volume-to-capacity ratios are 0.72 or less, and all movements operate at Level-of-Service C, or better. During the afternoon peak hour, all volume-to-capacity ratios are 0.70, or less, and all movements will operate at Level-of-Service D, or better.

Table 14 Level-of-Service Analysis - Old Haleakala Highway at Makawao Avenue and Loha Street

Street	2010 Background				2010 Background Plus Project				Changes	
	V/C ⁽³⁾	Delay ⁽⁴⁾	LOS ⁽⁴⁾		V/C	Delay	LOS		V/C	Delay
Peak Hour, Approach and Movement										
AM Peak Hour										
Eastbound Left	0.51	11.6	B		0.52	12.1	B		0.010	0.5
Eastbound Thru & Right	0.63	11.2	B		0.65	11.6	B		0.020	0.4
Westbound Left, Thru & Right	0.67	21.6	C		0.72	23.1	C		0.050	1.5
Northbound Left, Thru & Right	0.70	34.6	C		0.72	35.4	D		0.020	0.8
Southbound Left & Thru	0.43	28.4	C		0.43	28.7	C		0.000	0.3
Southbound Right	0.40	26.3	C		0.40	26.3	C		0.000	0.0
PM Peak Hour										
Eastbound Left	0.64	12.1	B		0.65	12.7	B		0.010	0.6
Eastbound Thru & Right	0.33	5.0	A		0.37	5.3	A		0.040	0.3
Westbound Left, Thru & Right	0.67	19.7	B		0.70	20.8	C		0.030	1.1
Northbound Left, Thru & Right	0.43	32.1	C		0.43	32.1	C		0.000	0.0
Southbound Left & Thru	0.63	40.2	D		0.63	40.2	D		0.000	0.0
Southbound Right	0.70	41.7	D		0.70	41.7	D		0.000	0.0

NOTES:
1. Peak hour conditions analyzed are "worst-case" conditions, which is the sum of the peak hour of the adjacent street plus the peak hour of the generator.
2. V/C denotes ratio of volume to capacity. V/C ratio is not calculated for unsignalized intersections.
3. LOS denotes Level-of-Service calculated using the operations method described in Highway Capacity Manual. LOS is based on delay.
4. LOS denotes Level-of-Service calculated using the operations method described in Highway Capacity Manual. LOS is based on delay.

7. Old Haleakala Highway at Pukalani Street

The results of the Level-of-Service analysis of the intersection of Old Haleakala Highway at Pukalani Street is summarized in Table 15. Overall the intersection will operate at Level-of-Service E during the morning peak hour and Level-of-Service C during the afternoon peak hour.

During the morning peak hour, only the eastbound right turn, the westbound through movement and the northbound right turn operate at acceptable levels-of-service. The remaining movements operate at Level-of-Service E or F.

During the afternoon peak hour, all movements except the westbound left will operate at Level-of-Service E, or better, even though the volume-to-capacity ratio is greater than 1.00.

Table 15 Level-of-Service Analysis - Old Haleakala Highway at Pukalani Street

Peak Hour, Approach and Movement	2010 Background				2010 Background Plus Project				Changes	
	V/C ⁽³⁾	Delay ⁽⁴⁾	LOS ⁽⁴⁾		V/C	Delay	LOS		V/C	Delay
AM Peak Hour										
Eastbound Thru	1.07	81.9	F		1.09	86.5	F		0.020	6.6
Eastbound Right	0.12	3.1	A		0.12	3.1	A		0.000	0.0
Westbound Left	1.08	89.5	F		1.12	105.4	F		0.040	15.9
Westbound Thru	0.38	10.8	B		0.40	11.0	B		0.020	0.2
Northbound Left	1.13	103.2	F		1.13	103.2	F		0.000	0.0
Northbound Right	0.29	8.3	A		0.30	8.4	A		0.010	0.1
PM Peak Hour										
Eastbound Thru	0.91	27.3	C		1.00	29.7	C		0.090	2.4
Eastbound Right	0.77	32.5	C		0.80	34.1	C		0.030	1.6
Westbound Left	0.77	16.7	B		0.77	16.7	B		0.000	0.0
Westbound Thru	0.99	52.9	D		1.02	63.3	E		0.030	10.4
Northbound Left	0.29	6.1	A		0.30	6.2	A		0.010	0.1
Northbound Right	0.77	40.8	D		0.77	40.8	D		0.000	0.0
Southbound Left	0.43	9.5	A		0.46	10.0	B		0.030	0.5

NOTES:
1. Peak hour conditions analyzed are "worst-case" conditions, which is the sum of the peak hour of the adjacent street plus the peak hour of the generator.
2. V/C denotes ratio of volume to capacity. V/C ratio is not calculated for unsignalized intersections.
3. LOS denotes Level-of-Service calculated using the operations method described in Highway Capacity Manual. LOS is based on delay.
4. LOS denotes Level-of-Service calculated using the operations method described in Highway Capacity Manual. LOS is based on delay.

8. Old Haleakala Highway at Makani Road

The results of the Level-of-Service analysis of the intersection of Old Haleakala Highway at Makani Road is summarized in Table 16. All movements will operate at Level-of-Service C, or better, except the southbound left turn, which will operate at Level-of-Service F during both peak periods, without and with the project. Even though the proposed project adds no traffic to this movement, the delays increase because of the additional traffic added to the eastbound and westbound through traffic, which translates into fewer acceptable gaps for the left turns and therefore a longer delay and lower level-of-service.

Table 16 Level-of-Service Analysis - Old Haleakala Highway at Makani Road

Peak Hour, Approach and Movement	2010 Background		2010 Background Plus Project		Changes
	Delay ⁽¹⁾	LOS ⁽²⁾	Delay	LOS	
AM Peak Hour					
Eastbound Left	12.1	B	12.3	B	0.2
Southbound Left	616.6	F	670.1	F	53.5
Southbound Right	20.6	C	21.0	C	0.4
PM Peak Hour					
Eastbound Left	9.3	A	9.3	A	0.0
Southbound Left	468.2	F	512.8	F	44.6
Southbound Right	13.1	B	13.2	B	0.1

NOTES:
 1. Peak hour conditions analyzed are "worst-case" conditions, which is the sum of the peak hour of the adjacent street plus the peak hour of the generator.
 2. V/C denotes ratio of volume to capacity. V/C ratio is not calculated for unsignalized intersections.
 3. Delay is in seconds per vehicle.
 4. LOS denotes Level-of-Service calculated using the operations method described in Highway Capacity Manual. LOS is based on delay.

9. Kula Highway at King Kekaulike High School Entrance

The results of the Level-of-Service analysis of the intersection of Kula Highway at King Kekaulike High School Entrance is summarized in Table 17. The northbound and southbound movements will operate at Level-of-Service F during the morning and afternoon peak hours. Eastbound and westbound traffic along Kula Highway will operate at Level-of-Service C or better.

As previously noted in Chapter 2 of this report, signalization has been discussed at several meetings on other development projects in the area. This intersection is also the subject of an analysis for another development project in the area. Recommendations for improving the levels-of-service of this intersection are under study.

Table 17 Level-of-Service Analysis - Kula Highway at King Kekaulike High School Entrance

Peak Hour, Approach and Movement	2010 Background		2010 Background Plus Project		Changes
	Delay ⁽¹⁾	LOS ⁽²⁾	Delay	LOS	
AM Peak Hour					
Eastbound Left	16.5	C	19.7	C	3.2
Westbound Left and Thru	9.6	A	9.8	A	0.2
Northbound Left, Thru and Right	>999.9	F	>999.9	F	0.0
Southbound Left and Thru	983.1	F	>999.9	F	16.8
Southbound Right	54.6	F	91.1	F	36.5
PM Peak Hour					
Eastbound Left	8.5	A	10.0	B	0.5
Westbound Left and Thru	9.0	A	9.6	A	0.6
Northbound Left, Thru and Right	70.4	F	101.9	F	31.5
Southbound Left and Thru	96.0	F	214.3	F	118.3
Southbound Right	21.9	C	28.8	D	6.9

NOTES:
 1. Peak hour conditions analyzed are "worst-case" conditions, which is the sum of the peak hour of the adjacent street plus the peak hour of the generator.
 2. V/C denotes ratio of volume to capacity. V/C ratio is not calculated for unsignalized intersections.
 3. Delay is in seconds per vehicle.
 4. LOS denotes Level-of-Service calculated using the operations method described in Highway Capacity Manual. LOS is based on delay.

10. Kula Highway at Kamehameha Schools and Kulamalu

The results of the Level-of-Service analysis of the intersection of Kula Highway at Kamehameha Schools and Kulamalu is summarized in Table 18. All movements will operate at Level-of-Service C, or better, during both peak periods, except the northbound left turn from Kamehameha School onto Kula Highway, which will operate at Level-of-Service F during the morning peak hour, without and with the project. As noted in Chapter 2, traffic signals are being designed and will be constructed upon approval from State of Hawaii Department of Transportation. For signalized conditions, the intersection will operate at Level-of-Service B during both morning and afternoon peak hours.

Table 18 Level-of-Service Analysis - Kula Highway at Kamehameha Schools and Kulamalu					
Peak Hour, Approach and Movement	2010 Background		2010 Background Plus Project		Changes
	Delay ¹⁾	LOS ²⁾	Delay	LOS	Delay
AM Peak Hour	Westbound Left	B	11.0	B	0.4
	Northbound Left	F	322.3	F	146.4
PM Peak Hour	Westbound Left	A	10.5	B	0.8
	Northbound Left	C	27.7	D	6.9
PM Peak Hour	Westbound Left	A	10.5	B	0.8
	Northbound Right	B	18.3	C	3.5

NOTES:

1. Peak hour conditions analyzed are "worst-case" conditions, which is the sum of the peak hour of the adjacent street plus the peak hour of the generator.
2. LOS denotes Level-of-Service calculated using the operations method described in Highway Capacity Manual. LOS is based on delay.
3. Delay is in seconds per vehicle.
4. LOS denotes Level-of-Service calculated using the operations method described in Highway Capacity Manual. LOS is based on delay.

11. Kula Highway at Thompson Road

The results of the Level-of-Service analysis of the intersection of Kula Highway at Thompson Road is summarized in Table 19. All movements will operate at Level-of-Service B, or better. This implies good operating conditions and acceptable levels-of-service without additional improvements.

Table 19 Level-of-Service Analysis - Kula Highway at Thompson Road					
Peak Hour, Approach and Movement	2010 Background		2010 Background Plus Project		Changes
	Delay ¹⁾	LOS ²⁾	Delay	LOS	Delay
AM Peak Hour	Eastbound Left and Thru	A	7.9	A	0.1
	Southbound Left and Right	B	10.3	B	0.2
PM Peak Hour	Eastbound Left and Thru	A	7.8	A	0.0
	Southbound Left and Right	B	10.7	B	0.2

NOTES:

1. Peak hour conditions analyzed are "worst-case" conditions, which is the sum of the peak hour of the adjacent street plus the peak hour of the generator.
2. LOS denotes Level-of-Service calculated using the operations method described in Highway Capacity Manual. LOS is based on delay.
3. Delay is in seconds per vehicle.
4. LOS denotes Level-of-Service calculated using the operations method described in Highway Capacity Manual. LOS is based on delay.

12. Kula Highway at Lau'ie Drive

The results of the Level-of-Service analysis of the intersection of Kula Highway at Lau'ie Drive is summarized in Table 20. All movements will operate at Level-of-Service C, or better. This implies good operating conditions and a high level-of-service. As the northbound left approach will operate at Level-of-Service E; mitigation will be required.

Table 20 Level-of-Service Analysis - Kula Highway at Lau'ie Drive					
Peak Hour, Approach and Movement	2010 Background		2010 Background Plus Project		Changes
	Delay ¹⁾	LOS ²⁾	Delay	LOS	Delay
AM Peak Hour	Westbound Left and Thru	A	8.0	A	0.2
	Northbound Left and Right	B	23.5	C	10.5
PM Peak Hour	Westbound Left and Thru	A	9.2	A	1.2
	Northbound Left and Right	B	39.5	E	25.0

NOTES:

1. Peak hour conditions analyzed are "worst-case" conditions, which is the sum of the peak hour of the adjacent street plus the peak hour of the generator.
2. LOS denotes Level-of-Service calculated using the operations method described in Highway Capacity Manual. LOS is based on delay.
3. Delay is in seconds per vehicle.
4. LOS denotes Level-of-Service calculated using the operations method described in Highway Capacity Manual. LOS is based on delay.

13. Kula Highway at Road B

The results of the Level-of-Service analysis of the intersection of Kula Highway at Road B is summarized in Table 21. All movements will operate at Level-of-Service B, or better. This implies good operating conditions and minimal delays. No additional improvements, such as separate left turn lanes, will be necessary for good operating conditions.

Table 21 Level-of-Service Analysis - Kula Highway at Road B					
Peak Hour, Approach and Movement	2010 Background Plus Project		2010 Background Plus Project		Changes
	Delay	LOS	Delay	LOS	
Peak Hour, Approach and Movement	Westbound Left and Thru	A	7.8	A	A
	Northbound Left and Right	B	12.0	B	B

NOTES:

1. Peak hour conditions analyzed are "worst-case" conditions, which is the sum of the peak hour of the adjacent street plus the peak hour of the generator.
2. LOS denotes Level-of-Service calculated using the operations method described in Highway Capacity Manual. LOS is based on delay.
3. Delay is in seconds per vehicle.
4. LOS denotes Level-of-Service calculated using the operations method described in Highway Capacity Manual. LOS is based on delay.

Conclusions of the Level-of-Service Analysis

The conclusion of the level-of-service analysis is that traffic generated by the Waiohuli Homestead Community will have an impact on the levels-of-service of the key intersections in the study area. However, there are no significant changes in the level-of-service of any of the study intersections as a result of traffic generated by the project. The background levels-of-service of several intersections will be below acceptable conditions whether the study project is constructed to full build-out or not because of the heavy background traffic volumes. These intersections are Haleakala Highway at Kula Highway, Haleakala Highway at Makawao Avenue, Haleakala Highway at Hana Highway and Kula Highway at King Kekaulike High School.

The low levels-of-service at these intersections are the result of regional traffic. Traffic generated by the study project comprises a small percentage (1.28% or less) of the total traffic projected to use these intersections during the peak hours. This is a clear indication that the low levels-of-service at these intersections are a regional issue that must be addressed on a regional basis. Improvements as identified in the *Maui Long-Range Land Transportation Plan* should be implemented. The applicant should be responsible for no more than the project's pro rata share of the total traffic using the intersections.

The conclusion of the level-of-service analysis of the intersections along Kula Highway serving the project will operate at high levels-of-service (Level-of-Service C or better) without additional lanes or improvement, except for the northbound approach of Lau'ie Drive at Kula Highway. This intersection should be improved to provide a separate left turn lane from Kula Highway into the project and a refuge lane for traffic turning left from the project onto Kula Highway. With these improvements, the intersection will operate at Level-of-Service C upon build-out of the project. It should be noted that this improvement will not be regarded until the project is in the later stages of full build-out. Accordingly, it is recommended that this intersection be monitored to determine when the improvements should be initiated. As the traffic projections assume worse-case conditions (the peak hour of project generated traffic coinciding with the peak hour of the roadway), the improvements may not be warranted upon build-out.

It should be noted that there may be horizontal and vertical alignment constraints that adversely impact the sight distances at the unsignalized intersections along Kula Highway in the Waiohuli and Keokea areas. The project Civil Engineer should verify that adequate sight distances are provided.